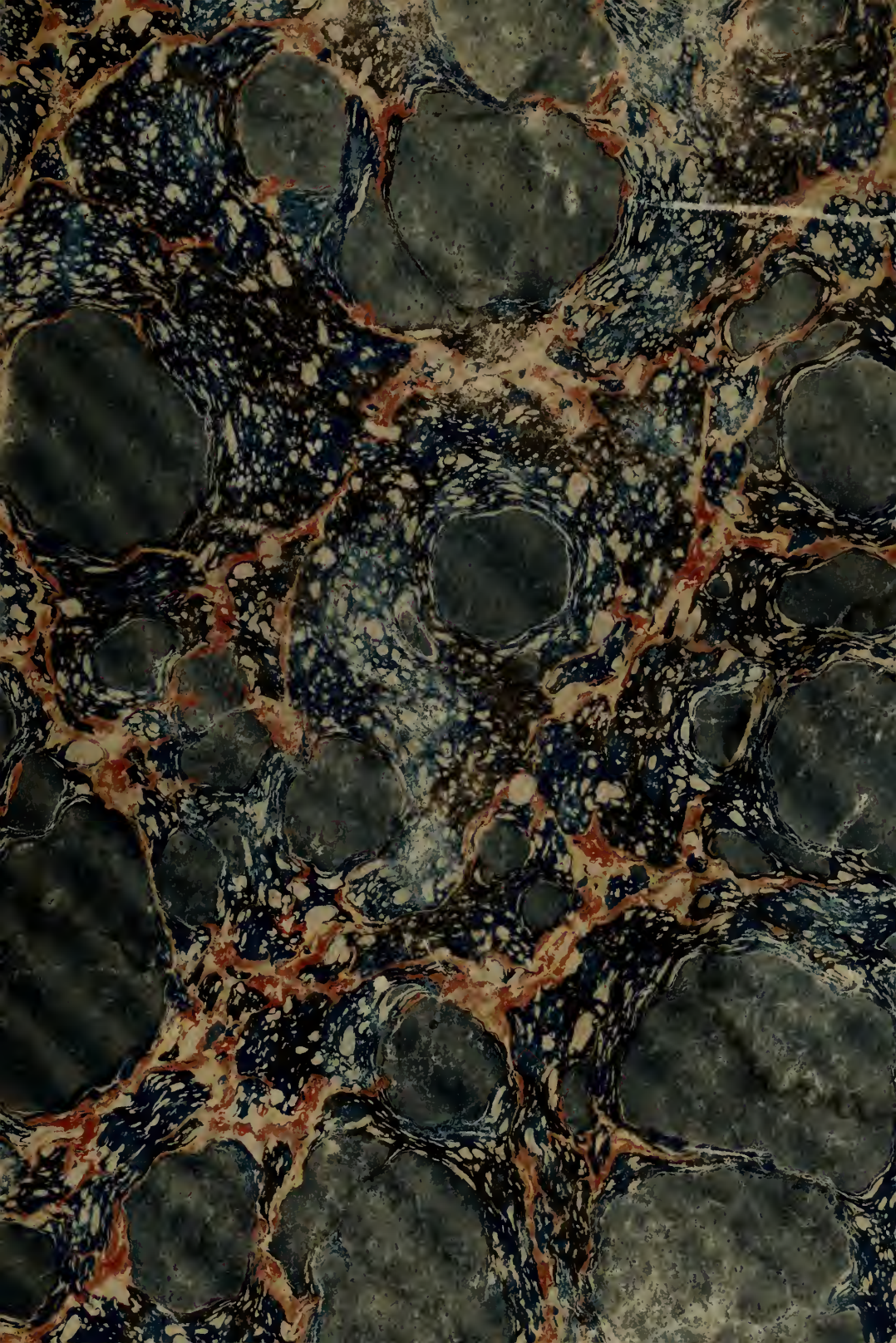

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TABULÆ METEOROLOGICÆ.

1837

EXPLANATION

EXPLANATION

LONDON — SWANSEA
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A
SYNOPTICAL CHART
of Meteorological Phenomena
AT EIGHT O'CLOCK A.M.
IN GREAT BRITAIN.
Arranged by
ROBERT FARR WOODS.

EXPLANATION

EXPLANATION

EXPLANATION.

The sixth column shews the amount of inches of Rain, at each station daily.

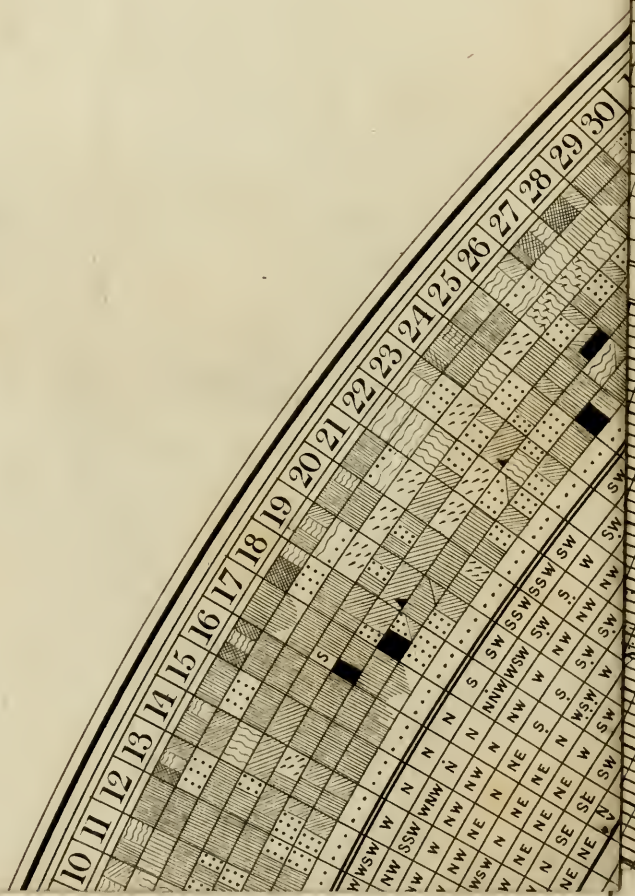
The seventh column shews when the Moon entered Aries, or Libra, when changes are said to take place in the weather.

The eighth column shews the Eclipses.

The ninth series of columns shews the monthly mean of the Barometer, Thermometer, & the amount of Rain.

The tenth column shews the mean Pressure, Temperature, and Rain, of the foregoing column.

Days when observations were not taken, are marked thus.....



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TRANSACTIONS

OF THE

METEOROLOGICAL SOCIETY.

INSTITUTED IN THE YEAR 1823.

VOL. I.

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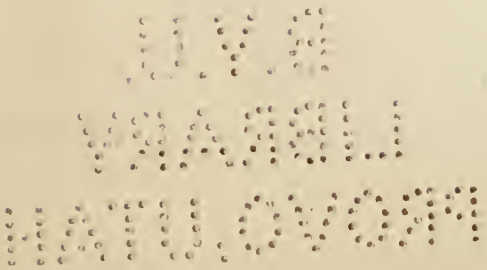

ADVERTISEMENT.

The Publishing Committee of the Meteorological Society take this opportunity of stating, that the Authors of the Papers contained in the present Volume are alone responsible both for the certainty of the facts and the propriety of the reasonings contained in their respective Papers.

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INTRODUCTORY REMARKS.

BY ÆNEAS M'INTYRE, LL.D., F.L.S., ETC.,

VICE-PRESIDENT OF THE SOCIETY.

THE introductory remarks to the First Part of the Meteorological Society's Transactions, would have emanated from the pen of our highly esteemed and talented President, had not a severe affliction of several months' duration, deprived both the Society and the public of his valuable scientific labours. This deprivation the Members of the Society feel very acutely; and, with the writer, they take this opportunity of expressing their sympathy, and of tendering this small tributary testimony to his unwearied exertions as a philosopher, and to his noble and generous spirit as a philanthropist. To this indisposition of the President must also be attributed the unavoidable delay which has taken place in the publication of the present volume, as well as the substitution of this hasty essay for the more deliberate production of the President's judgment.

Meteorology is the term now used for the purpose of designating the science which observes, registers, classifies, and compares the various and varying phenomena of our atmosphere. It remarks, at the same time, the connexion of these phenomena with the heavenly bodies, and with the solid and liquid materials of the earth, in reference to their reciprocal or combined influence in determining the character of different climates; and with the view, be it understood, of learning the meteoric history of every region of our globe, of ultimately investigating the laws of atmospheric change, the plan of meteoric action, the theory, in fact, of meteorological phenomena.

The laws of CLIMATE, then, are the main subject of meteorological research. And the practical importance of the science, therefore, to the Physician, the Agriculturist, and the Botanist, to the Traveller and the Navigator,—indeed to all classes of persons, is too obvious to require any detailed comment. On the state of the atmosphere, in fact, combined, however, in various degrees, with

local circumstances, essentially depends, not only the health and vigour, but oftentimes the very existence of all animal and vegetable life. To the Geologist, too, especially when he is admiring the fossil remains of organic beings, the contemplation of meteorological dynamics cannot possibly be devoid of interest and instruction. The theory of earthquakes, besides, is rarely supposed to be entirely disconnected with the condition of the air.*

Nor are the researches of the meteorologist, as they are defined above, restricted to the atmosphere alone. The ocean at various depths and in various latitudes and situations, the land at various distances below its surface and at various elevations above the sea, in different regions, and during the several seasons, demand his eager and accurate examination. Yet a sufficient accumulation of meteoric facts, in order to warrant any attempt at a logical exposition of the science, is at the present time allowed to be a desideratum: and that accumulation can be supplied only by an active and zealous co-operation of intelligent individuals, extending over the whole surface of the earth, as well as on the bosom of the ocean, and embracing every variety of local situation and geographical position. As soon, therefore, as this grand object can be effected, we may confidently anticipate a rapid advance towards the completion of our most ardent wishes in reference to this important science.

With these views, then, and for the purpose of establishing a focus, as it were, for the attraction and radiation of meteorological information throughout the world, this Society has been recently established. And a reference to the Appendix will show, by the great number of intelligent observers that are already in communication with the Society, that one important object has been partially effected. But, diffuse as may appear the stations already occupied, there is still a vast portion of the Globe, and chiefly as it respects the interior of Continents, large Islands, and the "bosom of the mass of waters," from which no accurate information is as yet attainable.

Man has already achieved much in other useful pursuits. He has measured the distances of the planets, and calculated the return of comets. He has penetrated the archives of ancient lore, and gained instruction from languages that

* Mr. Woods states that, in 300 earthquakes, the temperature rose, just prior to their occurrence, from 20° to 30°, with but 7 exceptions. In these, the temperature fell from 5° to 15°.

have long since ceased to be spoken. He has wandered among the ruins of fallen empires, and gathered wisdom from their desolation. And, at the present moment, he is propelling immense bodies over the ocean, against wind and tide, and ponderous vehicles along the roads, at the speed of the fleetest courser. Now, all these wonders have been accomplished entirely by his knowledge of physical principles and mechanical powers. And who can assign a limit to the extent of attainable knowledge?

With such results as these before us, we are induced to believe, that the phenomena of meteorology may, in process of time, be clearly and fully explained. The laws of Climate are, doubtless, as fixed and as certain as those of physical astronomy; and, consequently, derangements of the weather being the effects of determinate causes, they may possibly be ascertainable with the same precision as the recurrence of eclipses, or the occultation of the satellites of Jupiter.

Avoiding speculations of this kind, however, which must be entertained in later days, when logical deductions from accumulated observations shall warrant their being entertained, the great object of this Society at present, is, to observe and record the phenomena as they occur; the extensive and rapidly extending correspondence of its Members and Friends affording ample opportunities for synchronous observations, at stated periods, and at numerous and various stations.

The principal agencies, in the production of these phenomena, and to which attention is more particularly directed, are those of Light, Heat, Electricity, and Magnetism; thus procuring data towards the explication of the unceasingly varying effects of these four great agents in nature, whether on the surface of the land, on the moveable masses of water, or in the atmosphere with which they are encompassed.

Light.—The meteorological phenomena induced by the action of *light*, are chiefly, atmospheric refraction; the temperature of the different strata of the atmosphere; the tints which at certain times spread over the disc of the sun, the moon, and the stars; the various aspects of the waters of the ocean, of seas, and of lakes; the Fata-Morgana, the mirage, and, in fact, all those varied optical appearances which both celestial and terrestrial objects present, when seen through atmospheric strata of different degrees of elasticity.

Heat.—The phenomena connected with *heat*, namely, the variation of temperature on the land and the ocean, whether diurnal, nocturnal, or seasonal, from the equator to the poles, at various depths as well as on the surface; also, the influence of heat in the formation of fog and vapour, in the elevation and suspension of clouds, and in the descent of hail, rain, snow, or dew;—all are the objects of research and contemplation by the zealous Members of the Society.

Electricity.—In reference to the phenomena in connection with *electricity*, it is desirable to verify the electrical state of the atmosphere under every variety of condition, with its variation at different altitudes in all climates, and to note the numerous atmospherical phenomena that are influenced by electrical agency.

Magnetism.—The phenomena in connection with *magnetism* equally interest the promoters of Meteorological Science. Such are, the horizontal direction, the intensity, and the dip of the magnetic needle, in both hemispheres; the laws of magnetic intensity, as well on large continents as on the bosom of the ocean, in various latitudes; and also the laws of these changes in reference to their origin, intensity, and connection with other phenomena.

In addition to the subjects that are mentioned above, there are others of a more complicated nature, which enter into the domain of meteorology, and which are alike matters of great interest to naturalists; viz., the periodical and sudden movements of the barometric column, wind, hurricanes, water-spouts, meteors, aeroliths, the tides, waves, spouting fountains, hot springs and cold springs, volcanic eruptions, earthquakes.

The supreme importance of noting, in every district, the chemical *condition of the air, in conjunction with the state of the* weather, *and in relation to local or temporary* diseases *that affect our own species, as well as the comparative progress of* vegetation,—*we wish also strongly to impress on the attention of our correspondents.*

These are some of the grand problems which the Members of this Society feel desirous of solving. And meteorological science will progress in proportion to the increase, zeal, and activity of intelligent observers; each individual, as a part of an entire body, undoubtedly contributing to the advance of this science, and to

the accomplishment of the purposes for which the Society is established. It broods no baseless theory; it broaches no hypothesis; but it fosters the science which it professes to cultivate, inviting profound enquiries into the phenomena of nature; and thus, by its concentrated efforts, it hopes to effect a complete triumph over those difficulties which no individual observer could expect ever to surmount. And sound reasoning, as it forbids us, on the one hand, to cherish vague hypotheses, so, on the other hand, it allows us not to despair, that the theory of meteoric action may be ultimately detected and developed.

The analogy of other sciences is eminently encouraging. The superstitious terrors of astrology, and the vain labours of alchemy, have been succeeded, respectively, by the lucid theories of physical astronomy, and by the brilliant discoveries of modern chemistry. But a period intervened of accurate and enlightened observation and experiment, with logical deductions from undoubted facts. The science to which these pages refer, seems to have nearly passed through its first period, and to be now entering, with some vigour, on the period of observation and reason. The result we may leave, with confidence, to future times.

Independently, however, of a result so sublime as that to which I have just alluded, a complete description of the different regions of the earth, in relation to their respective meteorological conditions, cannot be otherwise than highly instructive to the philosopher, as well as eminently beneficial to the human race. And former observations of this kind, sadly limited and deplorably deficient as they are, already exhibit so strong a tendency towards a cyclical, if not an annual, average recurrence of meteorical phenomena, that this department of scientific research might, without much impropriety, be designated as meteorical statistics. At all events, it is abundantly evident, that, in default of such information, physical geography is deprived, not merely of a useful limb, but even of a vital organ.

Nor am I willingly silent respecting the light that time may thus throw on the former state and on the future prospects of the organized creation, by ascertaining whether the thermal condition of the earth's crust, with its circumambient Air, is advancing or receding. The recent discoveries of Geologists, and particularly in reference to fossil remains, seem to give an intense interest to this part of the subject.

The moral advantages, too, which must necessarily arise from the increasing multitude of intelligent minds that hold constant and intimate intercourse on subjects of rational curiosity and philosophical interest, cannot be too highly appreciated. And so nearly are the sciences connected, so intimate a relation exists amongst the various departments of rational inquiry, so closely united are the true subjects of human knowledge, the right objects of human research, — namely, *the works of the Creator, and the laws, physical and moral, by which these works are ruled,* —that an acquaintance with any new portion thereof necessarily throws additional light on all previous acquirements, and greatly facilitates the success of all future pursuits. Thus is knowledge accumulated, not in an arithmetical degree simply, but, so to speak, in a geometrical ratio; every forward point also advancing all the others.

But if any department of science is pre-eminently distinguished in this respect, it is surely meteorology,—the connector, as it were, of the heavens and the earth, the regulator of life and health, the grand medium of operation for the mighty agents already mentioned, whether they are the unerring ministry or the immediate execution of their Creator's will.

And in no field for mental contemplation, moreover, are instances of His power and wisdom and beneficence, more manifest, more frequent, more instructive.

But circumstances allowing a few hours only for the penning of these remarks, and therefore accounting for their desultory character, although perhaps not excusing it, I must for the present relinquish these fascinating speculations, with the remark, that there is an abundant harvest in prospect, even should our labours produce those fruits only which it is the *immediate* object of the Society to cultivate, as that object has been explained above.

Even the existing period seems to be peculiarly favourable. Meteorology, more perhaps than any other science, requires the aid of instruments; and the first of the following papers exhibits an experimental view, as well as a critical description, of these indispensable meteoric indicators; showing their general efficiency, and pointing out the recent improvements.

And although a considerable amelioration of the existing instruments, as well as new methods of ascertaining meteorical

statistics, may be confidently anticipated, the materials already at our command — their expensiveness alone excepted, — are admirably contrived, as ancillary means of meteoric registry.

The rapid intercourse between distant places which now prevails, as well by land as over the waters, conjoined with the increased and increasing intelligence of the conductors of that intercourse, may also be confidently expected to promote the views of this comprehensive science.

The extensive opportunities afforded, by the instrumentality of the numerous institutions which are in immediate connexion with the Trinity House, present another source of highly important intelligence. And many of the Consulates, too, throughout the commercial world, represented as they mostly are now, by persons of education and talent, may probably be appealed to shortly for unquestionable information. Aërostation, moreover, barren although it has hitherto been of useful intelligence, bids fairly, at length, to give material and peculiar aid to atmospheric research.

Yet so numerous are the stations required, so much of the time of intelligent persons is needed, and, what is perhaps more important still, so great is the expense of efficient instruments, — that, *without national aid*,—the day must be distant when the meteoric history of the earth can be laid, full and complete, before the philosopher and the statesman. The prospect of such aid, however, is even at present, by no means obscure; and the labours of this Society, conducted on scientific principles and with rational views, must rapidly accelerate the acquisition thereof.

In the meantime, the value of the smallest addition to real knowledge is beyond appreciation, its probable fruits beyond the power of calculation. And indubitable information is rapidly concentrating towards this Society, from which successive selections will be laid before the public, and with a care, too, that the progress of the science shall be thereby distinctly indicated.

In reference to the particular subjects of research, the most eligible stations, and the most proper hours for making the different observations, very useful hints are offered in some of the papers that follow.*

It may be sufficient, therefore, to notice here, that, in addition

* See also Sir J. Herschel's admirable "Instructions," &c. for South Africa.

to the geographical position of the selected or contingent station, it would be highly useful to know its *local* condition. This would be partly indicated, by its distance and bearing from the nearest sea, its elevation and aspect, with the nature of the surrounding parts, whether hilly or level, wooded or bare, waste or cultivated. The prevalent diseases in certain seasons, when such appear, and the previous or concomitant state of the atmosphere, both as it regards its chemical character and the general state of the weather, are noticed above as claiming more than ordinary attention. Nor will the relative state of vegetation meanwhile be overlooked by the physical enquirer. And in the vicinity of the sea, a specification of the general range of the tides* and of the hour at which it is first at its height daily, will not be neglected.

Besides a registry of phenomena as they occur at the selected hours of observation, and superadded to that registry, it is strongly recommended† in a recent essay, that *changes* should be recorded at whatever hour they may happen, and with such general observations as they may suggest. This seems to be an important rule.

Whether the plan of meteoric action, the key to meteorological phenomena, will ever be discovered in a manner analogous, in transcendent simplicity and beauty, to the discovery of the theory of the solar system, no one, as it has been already noticed, can presume to foretel. But neither can any one doubt, I think, that the track in which we are now moving is that which is the most likely to lead to the objects that we are pursuing.

When the patient and vigorous minds of the ancient Greeks applied their concentrated powers of investigation, — their δυναμις αναλυτικη—to the promotion of geometrical discoveries, could they have dreamed of the prodigious results that have already issued from their labours, followed up as those labours have been by modern mathematicians ?

By mathematics, moreover, must the theory of meteorology be ultimately investigated, and definitely expressed, if indeed that theory is placed within the range of human comprehension. And no wonder ; for mathematics is the instrument by which we

* This agency seems scarcely to have received merited attention.

† See Mr. Woods's *Tabulæ Meteorologicæ* for 1837.

investigate, the language in which we express, the ultimate laws of the physical creation, as far as a knowledge of those laws is attainable by man.

And assuredly, the very first efforts of this science are expressed chiefly by arithmetical signs, whilst the more tangled and obscure phenomena must refer, for explication and elucidation, to more abstruse forms of mathematical language. Of these things, our proceedings, in the sequel, will furnish instances in abundance.

It has been considered a matter of much importance, in the meantime, that our nomenclature should be settled, that the same alphabet should be used universally amongst meteorologists. And nothing is more likely to promote that object, than the medium of general intercourse which this Association secures. The desirable object in question, therefore, may be left with more propriety, to arise, as it shortly must arise, from a general feeling of its necessity, than from any dogmatical precepts in this place, restricted as it is mainly to a general view of our objects, our means, our wants, our hopes; not forgetting the vast importance of even partial success, or the pleasure and advantage ensured by the efforts alone.

The history of a science that has made good progress is generally replete with interest and instruction. But our present subject, as a philosophical pursuit, a rational aim, is little more than entering on the positive side of zero. And an enumeration of the negative lucubrations of bygone times, will be more appropriate and more amusing at a future day.

Nevertheless, no feeling of despondency ought to arise from the present infancy of the science. It is nursed, at length, by minds of matured intelligence, with extensive general information; and it mixes so intimately with the other natural sciences, adult or adolescent, if I may pursue the figure, that its rapid progress towards maturity may be very safely predicted. Faint, indeed, were once the glimmerings in other subjects of research, that have recently burst forth with ineffable splendour.

February, 1839.

TRANSACTIONS

OF THE

METEOROLOGICAL SOCIETY.

I.

DIRECTIONS FOR MAKING METEOROLOGICAL OBSERVATIONS ON LAND OR AT SEA, WITH SOME REMARKS ON THE SUBJECTS OF METEOROLOGICAL RESEARCH.—BY ROBERT CARR WOODS, ESQ., REGISTRAR, MEMBER OF THE COUNCIL, ETC.

INTRODUCTION.

ON the investigation of atmospherical phenomena, celestial and terrestrial, is founded the Science of Meteorology. It is an inductive science, and, consequently, attended with all the difficulties of pursuits of this nature. To observe and register meteoric phenomena occurring in the upper and lower regions of the atmosphere, and by the analogy of those facts, to trace the formation and development of the phenomena of nature,—thence endeavour to explain the causes from which they arise, and the sources whence they proceed, together with the probable periods of their return,—are the ultimate objects of the meteorologist.

If antiquity and utility can claim for any of the Sister Sciences IMPORTANCE, Meteorology possesses this in a superior degree: the first phenomenon, as recorded in the Mosaic history of the Creation, when it arose from the earth, could not but call the attention of the observer; while the periods of "seed-time and harvest," in the first ages of meteorological science amongst the Egyptians, Greeks, and Romans, were determined

by the return of certain phenomena. The knowledge of atmospherical phenomena among the Egyptians was founded on astro-meteorological principles: this knowledge increased under the fostering hand of the Assyrians and Babylonians, and was finally matured by the Greeks and Romans; thus, Virgil dates the subjects of his song and begins his Georgics with the celestial signs of the seasons. Among the Egyptians, the approach of Sirius foretold the annual overflowing of their famous river, the Nile; the labours of the husbandman commenced when these waters retired to the deep; he perceived the approach of the vernal season by the setting of Pisces; and regulated his agricultural employments by the signs of the Zodiac. It was also necessary for the mariner of antiquity not only to be familiar with the several ports in his track, and the rocks and quicksands of the intervening deep; he must know the course of the winds, and the indications which preceded them, and understand the wind and weather portended by the propitious or unfavourable appearance of Orion, Arcturus and the Pleiades.

Many difficulties present themselves in the study of this all-embracing science. An intimate acquaintance is required with the sciences of Geography, Mineralogy, and the general principles of Natural Philosophy, before much certain and successful progress can be made in elucidating the processes of the phenomena of nature. Let not the observer who has just entered the field of meteorological enquiry be deterred from pursuing his researches by the voluminous data required before satisfactory results are obtained. These difficulties, however great, are not insurmountable; they recede as he advances, and, like the "nubis matin," or the early dew before the rays of the rising sun, soon vanish. It must ever be borne in mind, that in this or any other science, it is chiefly to co-operation we must look for the supply of solid materials, ere the temple of practical Philosophy can be raised, whose foundation must be Truth, and its pillars Experience.

Meteorology, it may truly be said, affects every class and condition of life;—the agricultural—the commercial and maritime communities being alike interested in the important changes in the atmosphere, which oftentimes spread their devastating rage over the labours of the husbandman, blasting his brightest prospects and disappointing his cherished hope of a successful harvest,—or

proving the messenger of destruction to the voyager whose barque is tossed to and fro by the merciless wind and uplifted wave! It is to the benefit of these individuals that the labours of the meteorologist are chiefly devoted, and with this ultimate object in view was the Society founded.

Meteorological observations must not be confined to certain tracts or countries, but should be extended over the whole surface of the globe; embracing every variety of local and geographical position; the mountain and the valley; the ocean and the stream; the canopy of the heavens; the bowels of the earth; the tropics and the poles. Until such data are accumulated from parts remotely situated from each other, and these compared together to ascertain when certain phenomena commenced, the directions they took, and the phenomena consequent thereon noted, nothing but doubt and uncertainty will prevail. The fact need scarcely be stated, that if there be a *diminution* of pressure in one place there must be a corresponding *increase* in some other; hence, if nearly one-fifteenth of the whole atmospheric pressure has gone from any given locality, and the mercurial column in the tube of the barometer be observed to *fall* two inches, there must be elsewhere an additional weight or pressure causing the barometer to *rise* two inches, and *vice versa*,—unless that portion of the atmosphere *departed* from the *one locality* is *diffused* over *many*. It is obvious, under such circumstances, the increase in any of these would be small, and the rise of the barometric column trifling. The absent portion of the atmosphere is not, of course, annihilated. Here then we see the necessity of having before us regular series of observations, made, if possible, simultaneously and uniformly, at various stations, remote from the sea,—along the sea-coasts—on islands — and at sea. The absence of these observations is the chief cause of the slow progress of the science of Meteorology; and hence the objections so often urged against the science, and the discouragement given to its pursuit by the prevailing opinion that it has no data. It may, however, be hoped the number of observers will be greatly augmented, and the results of their *individual* labours forwarded to the Meteorological Society, who, as a *body*, will be able, by means of a combination of agency, to concentrate the multiplied observations of distant observers, and reduce them to practical utility.

Those who may be desirous of furthering this great object of meteorological inquiry, and are unacquainted with the manner of making observations, and a systematic arrangement, or who may not possess instruments of the most accurate construction, will probably find the following pages useful in recording their observations with greater exactness.

LOCALITY.

The choice of a Local Position is of vast importance to the meteorologist, and should, if circumstances permit, be well considered, as the success of his observations will depend on the selection of some eligible spot where he can uninterruptedly observe the phenomena around him.* Unfortunately, it is beyond the province of the Meteorological Society to fix the station of observers; they can only state the adaptation of this or that locality, and leave the results to be determined by the convenience of its members. But, as there are some lines or districts which, from their geographical position, possess peculiar advantages for observing one or more phenomena better than the whole range, as the tops of high mountains, &c., they must not be overlooked or considered unimportant. Thus, as connected with the clearness of the atmosphere by day and night, and the phenomenon of light, I have observed, both in summer and winter, in the south-east and north-west, especially in the latter, peculiar effulgence, similar to, but certainly not the Zodiacal light, being always seen on the magnetic meridian, when the remainder of the heavens has been overcast. My position was uninterrupted by the interference of hills, with a clear horizon; and being considerably elevated, was above the mist and lower strata of clouds, while a ridge of hills to

* I know not of any series of observations that would be so valuable, or so easy to be taken, as those of Harbour-masters, who keep an uninterrupted look-out day and night, if they were provided with proper instruments. I never found one unwilling to co-operate. Why does not the Government, then, or Harbour Commissioners, encourage and request these observations to be taken? The expense would be small, the advantage incalculable.

the south, served as a reflector to the beams of the "offspring of heaven!—first-born!"* In other respects, observers should be stationed at some distance from each other on isothermal lines, so that, in their transit across these lines, the extent and direction, regular or irregular, of local phenomena, as hurricanes, tropical rains, uninterrupted currents, or sudden gusts of wind, &c., may be precisely determined. But if, instead of this proper arrangement, the observations are made merely in scattered directions, they would not avail anything, as the object of observing at various stations is to show the state of the atmosphere over such lines or districts. At present the number of observers are *few*, and consequently the space over which we have any command *very limited*, so that our members, instead of being arranged in systematic belts around the planet we inhabit, are scattered in groupes along the coast. Hence it is that we are comparatively unacquainted with the interior of continents, and therefore prevented from tracing the "moving ether" over them, and have in their place only a register of sea-breezes, &c.

The geographical situation of England, and the changeableness of its climate, render it peculiarly interesting to the meteorologist,—not probably as the source of atmospheric disturbances, but as the recipient of the phenomena of other parts of the globe; and, indeed, all islands possess advantages for local observations, from the ever-varying state of the atmospheres which peculiarly surround them, and which being in the continual receipt of phenomena of the surrounding ocean or adjacent continents, produce those constant convulsions and fickle conditions of the air,—pressure, temperature, wind, and other phenomena. By far the most interesting portion of the globe for meteorological research, and the discovery of meteorological originations by their effects, is the African promontory, the southern extremity of America, or the hitherto neglected region of Caucasus.

In selecting points as meteorological stations, some should be elevated, and others near the presumed level of the sea, so that

* I have observed this phenomenon since the year 1830, and, in all probability, many meteorologists before this period. If, however, the phenomenon has been observed in America with the same peculiar display, it would be important to determine the source of this magnetic light—if it be magnetic.

each station may unite in itself several climates, and the observer be able to detect opposing currents of air in the regions of the atmosphere, &c. &c. In the interior of continents, the vicinity of a lake, a river, or a spring, is preferable.

GENERAL DIRECTIONS.

Before commencing, the observer should consider how far convenience will permit him to enter upon the task; for though it is desirable to keep a register of *all* the phenomena in meteorological science, yet, where circumstances prevent, he had better select certain of the most important, lay down his rules accordingly, and strictly adhere thereto. A few observations taken with *great care* are of more service to a meteorological "redacteur" than many observations taken at interrupted periods. It is the order and continuity of observations from whence inferences may be drawn; they should therefore be interfered with as little as possible by changes of locality—adjustments of instruments—exposure—or the reading off and registering them. Should circumstances arise so as to occasion any alteration to be made, the particulars should be noted in the register. The form of register most to be recommended is shewn in the annexed table. Were this formula generally used by those who are in correspondence with the Society, it would relieve the Committee appointed to reduce the thermometric and barometric curves, &c. of considerable tedious labour. As far as possible these registers should be complete; but if by reason of illness, absence from home, or from other causes, blanks occur, they had better remain so: any attempt to fill them up by mere recollection, or extracts from the journals of others in the immediate neighbourhood, or, which is sometimes the case, from inspection of the apparent course of the figures, is just the same as to lead another observer into a maze without affording him the means of extricating himself.

The observations should be recorded at the time they are made, and entered in the register. Sir John Herschel recommends that "the numbers entered should be those actually read

METEOROLOGICAL JOURNAL

For the —— 18——

Kept at By

LATITUDE LONGITUDE.

Day.	Barometer.			Thermometers Attached.			External Thermometers.					D.f. of Wet and Dry Bulb.	Dew points.			Hygrometer.		Rain in inches.	Evap. in inches.	Winds.		Passing clouds.	REMARKS.
	9 A.M.	3 P.M.	9 P.M.	9 A.M.	3 P.M.	9 P.M.	9 M.A.	3 P.M.	9 P.M.	Max.	Min.		9 A.M.	3 P.M.	9 P.M.	Max.	Min.			A.M.	P.M.		
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MEAN ..																							

RESULTS.

BAROMETRICAL RESULTS.

Highest on ..... at ..... Lowest on ..... at .....
Mean of Max. & Min. ..... Range of Mer. .....
Mean pressure for the Month .....
———————— for Lunar period ending .....
———————— for ..... days Moon in N. Dec. .....
———————— for ..... days Moon in S. Dec. .....
Greatest variation in 24 hrs. .. ..

THERMOMETRICAL RESULTS.

Max. on ..... at ..... Min. on ..... at .....
Mean of Max. and Min. ..... Range of temp. .....
Mean temp. of External Air for the Month ....
———————— by Attached Thermometer .....
———————— for ..... days, Sun in .....
Greatest variation in 24 hrs. .....

HYGROMETRICAL RESULTS.

Greatest Humidity ..... at ....
Greatest Dryness ..... at .....
Mean of Max. & Min. ..... Range .....
Mean for the Month ..... Greatest var. for 24 hrs.

CLOUDS.

Cirrus	Cirrocumulus	Cirrostratus	Stratus
...	...	...	...

Cumulus	Cumulostratus	Nimbus
...	...	...

SCALE OF WINDS.

A.M.

N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Var.
...	...	...	...	...	...	...	...	...

P.M.

N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Var.
...	...	...	...	...	...	...	...	...

Barometer ..... feet above Mean level of the Sea. Thermometers ..... aspect ..... from the Earth ..... from the Wall.

MONTHLY SUMMARY.

. . . . . .

off on the respective scales of each instrument, on no account applying to them previous to entry any sort of correction, as for instance, for zero, for temperature, capillarity, &c. All these, and the like corrections, being matter of calculation and reasoning from other observations, are to be reserved till the final discussion of the series, and for separate determination and statement." When these corrections have been applied, it should be stated on the register. Two or more of these registers should be kept, —the copies being carefully compared with the original,—and the latter transmitted monthly by members of the Society, and by Associates (members not residing in Great Britain), at their earliest convenience, that the committee may experience as little delay as possible.

TIMES OF OBSERVATION.

Meteorological observations should be made at certain hours daily. The proper hours for observing the ordinary phenomena of the atmosphere, are probably those pointed out by the barometer.* This instrument usually reaches its maximum height at nine in the morning, mean at twelve, and the minimum at three in the afternoon. The hours in the blank journals of the Meteorological Society are 9 A.M., 3 P.M., and 9 P.M. Where observers can avail themselves of three observations, (and that observer learns most from nature's pages who *observes most*,) these hours should be preferred; but if from circumstances he can only take two observations, the first and last hours should be chosen,—if only one observation, noon is preferable. Some sacrifice of system must of necessity be made for the convenience of the observer. Sir John Herschel considers the best hours in a scientific point of view, to be those of sunrise, noon, sunset, and midnight—the last is not, however, very likely to be taken, excepting on important occasions, or in an astronomical observatory. Whatever hours are selected by an observer, they should

* Professor Daniell.

be specified on every page of his register, and *very strictly adhered to.*

It will, however, be remembered that some of the most important phenomena occur in the night;—those silent hours wherein we rest unconscious of nature's ever-active powers:—the season of nature's conflicting efforts for light and darkness, heat and cold, day and night;—the curtain which veils the face of earth, and unfolds to our view the glittering shield of heaven! Here is the field o'er which the mind may expand and stretch its thoughts uninterrupted by the noise of the busy multitude, and unretarded by daily toil—this is the season peculiarly favourable to recondite searches after the sources of natural phenomena. Nocturnal observations present to a careful observer as much necessity for, and interest in, registering, as the diurnal, although hitherto they have been much neglected.

"With a view, however, to the better determining the laws of diurnal changes taking place in the body of the atmosphere, and to the obtaining a knowledge of the correspondence of its movements and affections over great regions of the earth's surface, or even over the whole globe, the committee have resolved to recommend, that four days in each year should henceforth be especially set apart by meteorologists in every part of the world, and devoted to a most scrupulous and accurate registry of the state of the barometer and thermometer; the direction and force of the wind; the quantity, character, and distribution of clouds; and every other particular of weather, throughout the whole twenty-four hours of those days, and the adjoining six hours of the days preceding and following. The days they have been induced to fix on and recommend for these observations are, the 21st of March, the 21st June, the 21st September, and the 21st December, being those, or immediately adjourning to those of the equinoxes and solstices, in which the solar influence is either stationary or in a state of most rapid variation. *But should any one of those* 21*st days fall on a Sunday, then it will be understood that the observations are to be deferred till the next day, the* 22*d.* The observations at each station should commence at 6 o'clock, A. M. of the appointed days, and terminate at 6 o'clock, P. M. of the days following, according to the usual reckoning of time at the place. During this interval the barometer and thermometer should be read off and registered hourly,

1837.

METEOROLOGICAL OBSERVATIONS

Made at London, for 37 successive hours, commencing at 6 A.M. of the 21st of December, 1837, and ending at 6 P.M. of the following day. (London clock-time.)

BY ROBERT CARR WOODS, ESQ.

LATITUDE 51° 30′ 49″ N. LONGITUDE 0° 5′ 46″ W.

Hours of Observation.	Barometer.	External Thermometer.	Dew point (Daniell's.) Hygro.	Wind.	Morrison's Magnet Electrometer.		REMARKS.
					+ or East.	— or West.	
6 A.M.	29·680	44°00	46	NNE	..	..	Breeze, preceded and succeeded by blasts, the air clear, stars scarcely perceptible.
7	29·730	43·25	..	NE by N	..	..	Day breaking beautifully, strong breeze, deep blue sky, small grey clouds, N. and E.
8	29·800	42·74	..	NNE var.	..	..	Strong breeze, clear ; a few particles of snow fell 5m. past 8.
9	29·885	43·25	41	NNE	..	..	Serene, Cumuli passing to the SSW.
10	29·910	42·51	..	NE	..	..	Sky clear as a morning in June in the N. and W., high stratus clouds in the S.
11	29·940	43·51	..	NE	..	..	Clear, wind little abated, dense vapour clouds rising in the NE.
12	29·960	43·75	42	NE	..	..	Clear.
1 P.M.	29·998	43·25	..	NE	..	..	Wind abating, copper-tinged clouds rising in the E., but soon disappeared.
2	30·005	43·23	..	NE	..	..	Becoming overcast.
3	30·030	43·26	40	ENE	..	..	Dull.
4	30·060	42·75	..	NE	..	..	Gentle wind, grey evening sky.
5	30·090	42·25	..	NE	..	..	Gentle wind, grey sky unbroken.
6	30·130	42·26	..	NE	..	..	Calm, few clouds passing to the W. consisting of broken stratus.
7	30·100	42·25	..	ENE var.	..	..	Calm ; at 7m. past 7 stars shone brightly for 2 minutes, when the wind varied to E., and they disappeared.
8	30·100	41·75	..	ENE	5°	..	Calm, sky deep grey.
9	30·120	41·75	..	ENE	3	..	Calm and dark sky.
10	30·130	42·25	..	E	..	..	Calm and cloudless ; the wind appears much unsettled.
11	30·130	42·00	..	ENE	..	..	Calm, clouds breaking in the NW.
12	30·130	41·50	40	ENE	..	..	Calm, few light clouds in the E.

1 A.M.	30·120	41·75	..	ENE	5	..	Calm.
2	30·110	40·35	..	NE	7	..	Gentle air.
3	30·112	40·55	39	NE	..	..	Cloudless.
4	30·070	40·25	..	NE	..	..	Cloudless.
5	30·050	40·25	..	NE	8	..	Cloudless.
6	30·030	42·25	..	NE	..	..	Cloudless.
7	30 032	43·00	..	ENE var.	..	..	Cloudless, mist gathering in NNE.
8	30·022	43·25	..	SW	..	..	Haze coming on.
9	30·005	45·00	44	SW	..	..	Cloudy.
10	30·000	46·00	..	WSW	9	..	Overcast; electrometer deflected, 12 degrees plus, 22 minutes past 10.
11	29·960	47·50	..	WSW	10	..	Cloudless.
12	29·945	47·30	47	SSW	17	..	Clouds lowering, "Scotch mist" falling, clouds passing rapidly to the ENE., electrometer deflected to 25 degrees plus, 13m. past 12.
1 P.M.	29·937	48·00	..	SW by W	14	..	Overcast.
2	29·937	48·00	..	SSW	12	..	Overcast.
3	29·900	49·50	48	SW	11	..	Dull, mist falling.
4	29·888	50·00	..	SW	12	..	Dull, gentle wind, very slight rain.
5	29·885	51·10	..	SW	13	..	Moderate breeze, cloudless.
6	29·885	51·25	51	SW	26	..	Moderate breeze.
MEAN.	29·996	43·94	43·7	NE	8°155	..	

BAROMETER.

Maximum on the 21st . .	30·130	Mean 30·125
Maximum on the 22nd . .	30·120	
Minimum on the 21st . .	29·680	Mean 29·782
Minimum on the 22nd . .	29·885	

THERMOMETER.

Maximum hourly readings on the 21st	44°0′	Mean 47°63
Maximum hourly readings on the 22nd	51°25	
Minimum hourly readings on the 21st	41°25	Mean 45°75
Minimum hourly readings on the 22nd	40°25	

Minimum on the 22nd, four feet above the ground, 40°50. Thirty feet above the ground, 39°0.

SOLAR RADIATION. December 21st . 0°05. December 22nd . 0°01.

The height of cistern of barometer, above high water (Thames), latter syzigy, 48 feet. Thermometer, northern aspect, 4 feet from the earth, and one foot from the wall. On the 22nd, my double self-registering thermometer, lying on the earth, was in both stems 36°75. The thermometer degrees are Fahrenheit. Amount of rain that fell during the observations, was 0·025 inches.

or at all events, at intervals not more than two hours asunder, and the precise hour *and minute* of each reading should be especially noted."*

These instructions of the distinguished astronomer and meteorologist—the brightest ornament of the Meteorological Society, were followed by Mr. Roberton, the under-secretary of the Royal Society—by several scientific institutions on the Continent and in America, and subsequently by a Committee selected from the Council of the Meteorological Society; copies of them have been forwarded to the Observatories and Philosophical Institutions of Great Britain, France, Belgium, Italy, Spain and Portugal, Russia, Austria, Prussia, South Africa, the United States, British North America, &c. &c. It is therefore earnestly requested that meteorologists in every part of the Globe will unite in making and registering the thirty-six hourly observations at the equinoxes and solstices, and in forwarding copies of the same to the Society in London, and the South African Institution. The form of table of these observations, as made by the Meteorological Society, is shewn in the accompanying sheet.

Moreover, as there is no part of the world whence meteorological observations are without interest, it is hoped that not only at stations on land, but also at sea, in every part of the ocean, persons will be found to co-operate in this important enquiry. All communications of this kind will be considered highly valuable, and are requested to be forwarded, with as little expense as possible, to the before-mentioned Societies.

METEOROLOGICAL INSTRUMENTS.

Among the ancients it was almost impossible that the science of meteorology could be successfully cultivated, dependent, as

* Sir John Herschel's "Instructions for Meteorological Observations," published by the South African Philosophical Institution.—Since writing the above extract, Sir John Herschel, in his letter to the Meteorological Society, dated June 1838, recommends a twenty-five hours' series, instead of thirty-seven, considering this number of hours sufficient for extra-tropical latitudes, and suggests them to be taken monthly, in the place of quarterly.

this science is, on inductive principles. Their senses, though peculiarly fine, and their capacious minds, though well instructed in the page of nature, were often misguided from the path of truth for the want of that assistance in directing their judgments which the moderns so eminently possess, namely, instruments. Hence, among other ancient errors "nature's abhorrence of a vacuum," &c. &c.

THE BAROMETER AND ATTACHED THERMOMETER.

But for the first-named instrument meteorology would be very obscure in some of its most important particulars. Its name is derived from two Greek words signifying a measure of weight: its use is to ascertain the actual pressure or weight of the body of the atmosphere on any given surface at the time of observation.

With regard to the weight and pressure of the atmosphere, it may be remarked, that it is a thin, invisible, and elastic fluid; consequently, it must act with a certain determinate pressure upon all bodies immersed in it. That it is elastic, or consists of a dilatable fluid, were some of the first rudiments of philosophy in the western part of the world.* Thus Aristotle says that all the elements (with the exception of fire) have weight; Plutarch and Stobæus quote Aristotle, as teaching that the weight of the air is between that of fire and earth; the latter philosopher also quotes Empedocles as attributing the act of respiration to the air's pressure.

It is now more than two hundred years since the attention of Galileo was called to a consideration of the air's pressure, by observing that water would not rise under the piston of a common water-pump to a greater height than about thirty-four feet: he failed in explaining the cause of this specified ascent, and attri-

* This principle of the air's elasticity was observed by Hero of Alexandria, who applied it in producing and explaining various effects; and his work, entitled *Spiritalia*, sufficiently proves that he was no stranger to the peculiar properties of atmospheric air. Ctesibus, adopting this principle of elasticity, constructed wind-guns, very similar to those known among the moderns as air-guns.

buted the rising of the water to the attraction between the piston and fluid particles. The phenomenon was explained by Torricelli, who referred it to the weight of the atmosphere, and illustrated the truth of the ascent of the water by the height to which it would, in like proportion, raise mercury or any other fluid in a tube hermetically sealed and exhausted of air.

Pascal was the first who observed the coincidence of variation in the column of mercury on changes of weather: these corresponding fluctuations have been noticed by succeeding observers, particularly on changes in the direction and strength of the winds. Observation and experiment fully prove that the height of the mercury in the tube of the barometer diminishes in the same proportion as the body of the atmosphere which supports it, and vice versâ. See page 3.

It may be necessary to remark how indispensable it is, that the barometer, and every other meteorological instrument, should be very accurately constructed. The reader will do well to attend to the advice of Professor Daniell on this subject in his "Meteorological Essays." It is much to be regretted that the time and labour of an observer should be fruitless from the inaccuracy of his instruments, which is but too common an occurrence.

Before *fixing* the barometer, *examine it* well, and see if air is in the column, either down the sides of the tube or above the mercury in that part called the vacuum chamber. To detect the presence of air within the tube, incline the instrument very gently until the upper part is a little below the horizontal position. If there be much air, it will be seen to run to and fro, and may be removed by inverting the instrument, and tapping with or against a cushion until it passes up the tube and enters the cistern. If there should still be *ever so small* a portion remaining, it will cause *great inaccuracy* in all the observations. The tube must now be detached from its frame, and gently tapped upon a piece of deal or other soft wood until the air is *entirely expelled;* afterwards carefully replace the tube on its frame. On inclining a barometer, if the mercury strikes the upper extremity of the tube *faintly*, or not with a sharp tapping noise, it is because air exists between the mercury and the glass.

Having attended to these precautions, make choice of a locality where it is to be fixed—if possible near a window facing the north, where it is not exposed to the rays of the sun, or subject

to sudden changes of temperature, as near a door for instance, where there are drafts of wind, &c. Adjust it perpendicularly by a plumb-line. The mercury is apt to adhere to the glass, particularly on sudden changes of temperature; it should be tapped gently before reading off. Bring the side of the vernier or the piece of metal which is attached to it and passes over the tube, always opposite to one part, so as to form a parallax. The correct part is the convex surface of the mercury, to which the mercury near the glass should be made a tangent; but if this cannot be conveniently done for want of a good light, the juncture line from the index to the mercury may be taken. Whichever mode is adopted, it should be adhered to and stated in the register.

"Barometric observations require corrections of three kinds, and to render them available and comparable with others, it is necessary that their amount should be ascertained and distinctly stated. The first is called the zero correction. It includes several subordinate corrections arising from different sources; such as that originating in a faulty placing of the scale of inches, that due to the capillary depression of the mercury in the glass tube,* and the constant part (which at a fixed station is nearly the whole) of the depression arising from the presence of air or vapour in the upper part of the tube.

"To determine the zero correction, the barometer must be compared with a standard instrument, such as that at the Royal Observatory, for instance, or some other which has been compared with it, or with some standard of equal authority. Such comparisons ought never to be omitted before forwarding the barometer to its place of destination, nor should any opportunity be neglected of comparing it when fixed in its place, with a good portable barometer. In making such comparisons, all that is necessary is to record the readings of both the instruments, after at least an hour's quiet exposure, side by side, that they may have the same temperature.† If compared by two observers,

* In a large tube the weight of mercury is so great, that the motion of it will not be hindered by any attraction or repulsion of the glass upon it; whereas, in a small tube, where the weight of mercury is less, the action of the glass is considerable in proportion to that weight, and consequently the variations will be less upon a given change of the atmospheric pressure.

† This need not be done where convenience or circumstances will not permit, in

each should read off his own barometer in his usual manner, and each should take a mean of several readings, then each should verify the other's results. By this means the Zero of one standard may be transported over all the world, and that of others compared with it ascertained.*

"The amount of the Zero correction is often very large, as two or three tenths of an inch; but its influence on the mean results of recorded observations, falls wholly on the determination of the height of the station of observation above the mean level of the sea, and affects little, if at all, any conclusions of a meteorological nature which may be deduced from them. Hence, if proper care be taken to preserve a barometer, once set up, immoveable, a long and regular series of observations with it has a value independent of any knowledge of this element, and it is fortunate that this is the case, as the Zero correction is one extremely difficult to determine à priori."—Sir John F. W. Herschel.

The next and most important correction is for changes of temperature. On or near the barometer is placed a thermometer, which is called the *attached* thermometer, and which is to be noted in the register whenever an observation is taken of the former instrument. If it has but one thermometer, it should be placed with its bulb within the cistern, or, in the absence of this, a portion of mercury should be placed near it in a vessel containing a thermometer immersed in the fluid: this thermometer may be read off as the attached thermometer. The attached thermometer should be read off *first*, as the heat of the breath or body while standing near it will cause it to rise one or more degrees. From numerous experiments on the temperature by attached thermometers, I have considered *three* preferable, if not necessary, viz., one with its bulb within the cistern, and two

places near to each other, where the height of the cistern of each is known above the level of the sea. For adding or deducting the height of one above the other, as the circumstances may require, the remainder will show the amount of correction due to the improper placing of the scale of inches, &c.

* The following is extracted from the minutes of the Meteorological Society:—"Mr. Woods, of No. 47, Hatton Garden, London, maker of the Society's Standard Instruments, has kindly consented to attest the instruments of all observers by the Standards of the Society." The Standard Barometer of the Society is perhaps the largest instrument of this kind in existence, and contains seventy pounds of mercury.

placed beside the vacuum chamber. Of the two latter, one should be mercurial and the other alcohol. At different degrees of barometric pressure, I have observed them to give different results. When discrepancies occur, the mean of the three may be taken for the temperature by *attached thermometer*.

The third and last correction is from a change of level of the mercury in the cistern of the barometer, occasioned by a portion of its contents being transferred to or from the tube. This is seen on observing the neutral point marked on the ivory float, or cistern-guage, *sinking* as the mercury in the tube *rises*, and *vice versa*. In barometers with small cisterns the correction for capacity is large, making the apparent fluctuation less than the real; this amount should in a *fixed proportion* be ascertained, first, by learning the internal and external diameters of the tube, and secondly, the diameter of the cistern. The proportion of tube to cistern is generally given by the maker, and if not engraved on the instrument should be learned of him. The corrections necessary for capillarity, capacity and temperature should be stated in the register, unless the observer gives the entries correction before registering them. It may however be remarked that for meteorological purposes it will be sufficient to correct the mean results.*

For the information of such as are not well versed in the connection that is observed between the indications of the barometer and changes in the weather, it may be interesting to the reader to remark:—

1st. It is generally high in serene and settled weather; and when the atmosphere is clear, and the barometer rises, a continuance of fair weather be expected.

2nd. When the barometer is low, and the clouds disperse, it usually becomes stationary: if it then begin to rise, it shows a disposition in the atmosphere for fair weather: if after remaining stationary for some hours it begin again to fall, a strong gale accompanied with hail and heavy rain may be expected.

* To obtain the maxima and minima of barometric pressure in the absence of the observer, I have constructed a self-registering barometer; for an account of which, see the London journals for January 1838.

3rd. When the thermometer is very high for the season, and the barometer falls, thunder will follow.

4th. In winter, when the thermometer is low and the barometer rising, it shows settled frost and snow,—but if the thermometer rises and the barometer falls, a thaw will follow.

5th. It sinks lowest of all when high winds approach—although they may not be attended with any rain—except when an easterly or north-easterly wind prevails, when it rises higher than ordinarily.*

6th. Our prognostic of the weather is to be guided relatively and comparatively: relatively—as notwithstanding the sinking of the mercury, if little or no rain follow, and it afterwards rise, we may expect a continuance of fair weather: comparatively—because the barometer when rising or falling should be compared with the general character of the weather at the time of observation.

7th. The weather from morning to evening may be foretold with usual certainty; thus, if the mercury in the tube of the barometer has risen during the night and still rises, the clouds lofty and dispersing, and the wind calm, a fair day may confidently be expected.

THE SYMPIESOMETER.

This instrument was introduced to supersede the barometer. It depends upon the principle of temperature, and is perhaps too sensitive, or requires its indications to be regulated by the barometer. "Indeed," said Lieut. Becher, "in sailing round Cape Horn, it was like a raw recruit alongside an old soldier." Between the tropics, where it is not exposed to sudden alterations of temperature, and where the fluctuation of the barometer is small, it is of great service. In observing, note what is the temperature of the air by the thermometer on the left of the sympiesometer tube, and place the index of the brass scale on the

* These observations are confined to England. More northerly places have a greater alteration of the rise and fall of the mercury than the more southerly.

right hand of the tube which moves from the outer frame to the degree corresponding with the temperature of the air, and the coloured fluid will stand coincident with the divisions of the barometric scale graduated thereon.

TEMPERATURE.

The temperature of the atmosphere is a subject so important to meteorological inquiry, that the meteorologist is continually engaged in tracing out its ever-variable and active path. It is not, however, my design here to enter upon the subject of atmospherical temperature, but merely to state how far our acquaintance with it may be increased by the use of those instruments whose bulk is changed by alterations in their temperature. That the ancients were aware that aëriform and fluid bodies underwent changes of volume, is very certain—their only mode being the indications of their senses or the limited knowledge they acquired from observing the melting or combustion of different substances within their sphere of observation. It is the moderns who receive the advantage of the inquiries of Santorio, and the inventive mechanical genius of Drebbel.

EXTERNAL THERMOMETER.

The external thermometer should be a mercurial one, well exhausted of air,* and the graduated scale divided to tenths of a degree, or into quarters of a degree, or with whole divisions large enough to be divided into as many parts by the eye. Choose a locality for the instrument where it will be well exposed to the ambient air—apart from the reflection of sun-beams, &c.—and where it may be distinctly read off

* On inclining the tube of an exhausted thermometer, the mercury will flow freely from the bulb, not in detached parts, but a continuous stream. If it will not flow, it had better be set aside as unfit for delicate observations, at least.

without inconvenience. It should be read off as quickly as possible.

For uniformity of system it should be read off at stated periods, say the same hours at which the barometer, &c. are noted, and carefully watched in the interim, to see whenever any remarkable change occurs; before and after storms, during the eclipsing of the sun and moon, or the passage of dense clouds of vapour, &c. &c.

The external thermometer should be placed about four feet from the earth, and at least twelve inches from the wall or place to which it is attached. But in obtaining the daily thermometric curve its height above the soil must be regulated by the *geography* of the place; as, for instance, if at the distance of some hundred feet there are hills or close-planted trees, the thermometer should be placed *higher* than if there had been a common or extensive plain. The geography and geology of the place of observation should be inserted in the register.

SOLAR RADIATION.

This of course must be obtained by a different thermometer from the one just described. The thermometer exposed to the sun's rays should have a blackened ball, and the instrument, when used, laid on black cloth in a glass box, made air-tight, and raised to an angle at which the sun's rays will fall on it perpendicularly at the time of observation. As the heat of the solar rays will cause great expansion of the glass, it would be well to place the thermometer occasionally by the side of the one in the shade, to ascertain the difference, if any, existing between them. Another and better mode of obtaining the solar radiation is by Sir John Herschel's actinometer.

THE ACTINOMETER.

Sir John Herschel, at the third meeting of the British Association, submitted an instrument for measuring at any instant the

direct heating power of the solar ray. It is called an Actinometer; and it affords a DYNAMICAL measure of the solar radiation, viz. by receiving a quantity of heat per second, or any short space of time, on a surface exposed to the sun.

In making observations with this instrument, it should be freely exposed in the shade for one minute, and the variation read off: afterwards expose it for the same time to the solar action, and again note it; and lastly repeat the experiment in the shade. The mean of the two variations in the shade being subducted from the variation in the sun, the excess gives the dilation per minute due to the sun's rays; the quantity subducted being the effect of the other causes at the time.*

MAXIMUM AND MINIMUM.

The extremes of temperature are no less important to the meteorologist than interesting to the general observer. They are obtained by the self-registering thermometer. The first instrument of this kind was suggested by John Bernoulli, in a letter addressed to Leibnitz. Several forms of thermometers were communicated to the Royal Society by Lord Charles Cavendish. The next in point of time were the contrivances of Fitzgerald and Crighton. Six, Rutherford, Keith, Blackadder and Dr. Trail, have greatly added to our stock of self-registering thermometers. There are two kinds in general use; Mr. Six's which is placed vertically, and Dr. Rutherford's which is suspended horizontally. The latter is preferable on land, and from its simplicity, and lowness of price, has to a certain extent superseded the former. This ingenious contrivance was first described in the Transactions of the Royal Society of Edinburgh, Vol. iii. It consists of a spirit and mercurial thermometer, each provided with its own scale and placed horizontally on a piece of ivory, glass, or boxwood. The mercurial thermometer contains a piece of blue steel wire, which, being pushed towards the extremity of the scale by the expanded fluid, serves as an index—being left on the cooling of

* Report of the "British Association for the Advancement of Science."

the fluid in that situation to mark how high the temperature had been. The spirit thermometer contains a small enamel index, with a small knob or bead at each extremity; it lies in the spirit, allowing it to pass freely beyond it when expanded by heat; on cooling, however, from the attraction between the spirit and glass, the last film of the fluid is enabled to overcome the slight friction of the index on the inside of the tube, and to carry it back towards the bulb.

It may be necessary to remark, it should be placed out of doors —if possible in the same place as the "external thermometer" —and fastened in such a manner as to allow one end to be lifted up to bring the indices to the surfaces of the respective fluids. In doing this it would be well to keep the needle from the mercury, by the magnet, until the index of the alcohol thermometer rests upon the last film, or it may fall into the quicksilver, from whence it would require to be extricated. To detect any inaccuracy arising from currents of air, &c., the writer has constructed a double self-registering thermometer, in which the discrepancy, arising from the cause just mentioned, is immediately perceived and corrected, by taking the mean of the two readings as the mean minimum of the locality. This contrivance is also applied to the maximum scale.

The minimum of temperature, as indicated by the spirit thermometer, should be read off early in the morning. The minimum usually occurs a little before sun-rise. The maximum in this country, is generally about three o'clock in the afternoon, but should not be read off until the sun is below the western horizon. The index of the spirit thermometer should be readjusted at mid-day, and the mercurial early in the morning. Whenever a double maximum or minimum, or both occurs, it should be especially noted in the register as "supernumerary."

TEMPERATURE OF THE EARTH.

It is very desirable to ascertain the temperature of the earth to the depth of twenty-five or thirty feet, to determine the effect

of the sun in penetrating the earth, by examining the monthly changes of temperature of soil. From a mean of observations made under the care of Professor Quetelet at the "Royal Academie des Sciences," Brussels, it is stated that the maximum effect of the sun, twenty-four feet below the surface of the earth, is on the 13th December, and its minimum effect on the 14th June.

Thermometers used for this purpose should be wrapped up in woollen cloth, and placed in strong earthen vessels, of such a form as that they may be withdrawn and the temperature read off without affecting the thermometer.

The lateral galleries of deep dry pits should be taken advantage of for this purpose, first, obtaining their depth below the level of the sea and the earth, and secondly, how far they are exempt from the influence of the outer air. In the absence of these pits, a pipe of earthenware, lead, or wood, in separate parts, may be sunk twenty or thirty feet below the earth, and the thermometer lowered by a chain. At every two or three feet the pipe should be obstructed by some stuffing which may be easily removed or hooked up, and the thermometer examined.*

THE TEMPERATURE OF THE SEA,

At the surface of the water, and at certain depths, is the next important point, and should be entered in the register with the same regularity, and at the same time, as the barometer and thermometer. The remarks of voyagers are less useful than those made on shore, because they are not *local*, or made in one fixed place; they are nevertheless valuable — particularly experiments on the temperature of the ocean at *various depths*.

The instrument best adapted for this purpose is Six's self-registering thermometer. This instrument is, in fact, an alcohol thermometer, with a cylindrical bulb, and the cane of the tube

* Straw may be used; but in no case ought hay or wool be introduced. Horse hair is the best stuffing for this purpose; it will not attract moisture, like the materials just mentioned.

bent in the form of a syphon, with parallel legs, and terminating in a small cavity. The alcohol should be highly rectified; for the most part they are now improperly made with weak spirits of wine, or, what is worse, a mixture of salt and water. For the cause of science, this departure from the true construction is much to be regretted. Into the lower parts of the syphon is introduced a column of quicksilver; that on the left hand is the minimum, and on the right is the maximum; in each column is a steel index coated with glass. Both indices are forced upward, the former by the retrocession of the mercurial column, and the latter by the advancement of the mercury occasioned by a change in the bulk of the fluid within the cylinder. This thermometer is placed in a copper case, with an upper and lower valve, which admits of the thermomter being hauled up without being affected by transition through strata of different temperatures. If the observer is not in possession of an instrument of this kind, employ a common mercurial thermometer: let it remain in the water for some time, and when drawn up it must be done speedily, making some allowance for its being drawn through the warmer upper layers.

As travellers by sea have generally much leisure time, they may repeat these experiments often in the day, and if convenient at night also, with two thermometers, one on the surface and the other below it. Whenever the temperature falls suddenly three or four degrees, you may be sure of the approach of land. In the Gulf of Florida, thermometrical observations have superseded "the lead." On entering a new current there is a difference of temperature between the two ocean streams. Within a few miles of the entrance of Table Bay, a gentleman connected with the South African Institution once observed the temperature of the surface sink nine degrees Fahrenheit.

The difference of temperature between the water and the air should be noted, and the nature of the place of observation ascertained, its latitude, &c. &c. As an instance of this, in the passages of H.M.S. Cornwallis, I quote the following:—Parallel of Bermuda, temp. of air 80°, water 68°. Bermuda to the Gulf stream, temp. of water 14° higher than the air, and when in the stream, the water for two days continued 23° warmer than the air. In lat. 41° 7′, long. 62° 58′, air 52°, water 67°; 18 miles further northward,

air 45°, water 38°, or 29° ! This was on the 30th December: at noon, air 44°, water 40°, and at a depth of 250 fathoms, 37°. Along the shores and harbours of Nova Scotia, New Brunswick, it never varied more than 6°. At St. John's, temp. of air 0°, water 29°. At 6 P.M. January 29th, lat. 41° N., long. 65° 33′ W. temp. of air 34°, water 58°. "The previous night I witnessed, for the first time, several luminous meteors, which are seen like the ignis fatuus, flitting as fast as the eye can follow. Seven were observed at one time at the mast heads, yard-arms, &c.; they were seldom stationary, and appeared particularly brilliant during the raging of a squall. During the day we noticed a vapour passing over the sea, very close, like the veins of a partial fog; this no doubt was caused by the great difference in temperature between the air and water, it being 24° throughout. I have before mentioned the difficulty in defining the southern edge of the Gulf stream; in the present case, to within 150 miles of Bermuda the water continued 14° warmer than the air. We may, therefore, consider that the north-west storm of three days had driven the body of the stream far to the southward, and that at day-light, this morning, 31st, in latitude 37°, we crossed its southern edge, the thermometer at that time showing air 46°, water 66°; and four hours later it gave air 51°, water 65°." Nautical Magazine, July 1838. See also the interesting experiments of Captain Bayfield, in the Gulf of St. Lawrence, published in the same excellent journal.

On land the heat and relative warmth of springs near their source, at different depths, should be compared with the temperature of the air in the shade and in the sunshine. The contents of wells should be examined, and the increasing ratio of their temperature towards the bottom determined—guarding against the effects of local heat, and analyzing the water to see how far their temperature is or may be influenced by their mineral properties.

In Egypt it never freezes, and in some parts of Siberia it never thaws. The lowest degree of natural cold was probably experienced by Capt. Sir John Ross during his last Arctic expedition, the thermometer being 90° below the freezing point of water. The annual variation of heat is inconsiderable, and the time of maximum effect more uniform between the tropics, but the

variation becomes greater and its maximum effect takes place later, as we approach the poles, as shewn in the following table :—

Latitude.	Places.	Mean Temperature.
86° 30′ . . .	Wadso, Lapland .	36°
59 56	St. Petersburgh .	40
51 29 39·00 .	Greenwich . .	51·1
48 51 . . .	Paris	54
41 54	Rome	61
30 03	Cairo	73
20 00 . . .	Ocean	79
00 00	Ocean	81

While in the tropical regions there is a variation of only a few degrees; in the highest habitable latitudes the change amounts to 140°. If we take a portion of air near the surface of the earth at a temperature of 79° Fah. and ascend with it in a balloon to the height of about $2\frac{1}{2}$ miles, it will expand from the diminished pressure to double the bulk, and the temperature will be reduced about 59°. This height varies in different latitudes and at different seasons. Generally the cold is found to increase, from annual mean observations, at the rate of 1° for every 300 feet of elevation.

ATMOSPHERIC VAPOUR.

We are indebted to De Luc for proving that the amount and force of vapour in a vacuum of any given dimensions, are equal to its force and quantity in an equal volume of air, at the same temperature; or that the temperature of the air will determine the force and quantity of vapour held in it. M. Le Roi, however, first observed the temperature at which dew commences to be deposited, as a rule of ascertaining the moisture of the atmosphere. Mr. J. Dalton confirmed the observations of De Luc by investigating the force of vapour at every temperature, from Zero to the boiling point of water Fahrenheit, and expressed this force (of the vapour) by the height of the mercurial column it could support in the tube of the barometer. Dalton and Le Roi find the *dew point* by pouring *cold* water into a glass, and marking the temperature at which it just ceases to deposit dew on the

sides of the glass, in the open air. The temperature here observed is the point at which dew would begin to be formed. From this, Dalton infers not only the *force* exerted by the vapour, but also its *amount* in a perpendicular column of the whole atmosphere, and likewise the *force of evaporation* at the time of observation. One instance of this may suffice; thus if the *dew point* be 45° Fahrenheit, the force of vapour in Dalton's table =0·316 of an inch of the mercurial column, or $\frac{1}{95}$ of the whole atmospheric pressure; or, if the specific gravity of steam be 0·70, the weight of this vapour in a given volume of air will be $\frac{1}{136}$ part of the whole. If, then, a whole atmosphere of steam at the earth's surface, would be the weight of a perpendicular column of it, and as in a mixed atmosphere of steam and air, the force exerted by each is as their relative weights, it necessarily follows that when the juncture of deposition is 40°, the whole superincumbent column of vapour in the atmosphere being equal to the $\frac{1}{95}$ of the whole atmospheric pressure, will be equivalent to a pressure of 4·30 inches of water; or the vapour when condensed would yield that quantity of water.

THE HYGROMETER.

This instrument is used to ascertain the quantity of moisture held in the atmosphere. There are several kinds of hygrometers in use, namely, De Luc's, Saussure's, Leslie's, and Professor Daniell's, &c. Daniell's is preferable for determining the "dew point." It is used by the Royal Society, Meteorological Society, &c. The mode of using it is as follows:—The included ether is driven into the lower or blackened ball by the heat of the hand, holding the instrument in an inverted position, and the balls are placed perpendicularly on the metal stand: place it in an open window or some shaded situation, that the surface of the liquid may be on a level with the eye. The temperature of the air must now be noted by the external thermometer, and let fall a few drops of ether upon the covered ball. Evaporation immediately takes place, which, producing cold upon the ball, occasions a rapid evaporation, causing the thermometer in it to sink: when the backened ball is thus cooled to the dew point, a ring of condensed

vapour surrounds the ball, coincident with the surface of the ether. This deposition is immediate, hence the difficulty of determining the precise dew point. A dark object behind the instrument will greatly assist the eye in perceiving the juncture at which the dew begins to form. As a common hygrometer, all that is necessary to observe is the difference between the constituent temperature of the vapour and the air, as shown by the external thermometer. The probability of rain, or precipi tation of moisture from the atmosphere, is in an inverse proportion to this difference.

WET AND DRY BULB THERMOMETERS.

If the observer should not possess either of the hygrometers above mentioned, the dryness of the air may be ascertained by two thermometers placed near each other, so as not to touch, and free from all radiation. One of these thermometers should have its bulb covered or wrapped in linen or cotton, or muslin, with a small vessel of pure spring or rain water near it, and connected with it by a piece of cotton ; the water will be emptied from the vessel by the attraction of the cotton, and keep the bulb *constantly wetted.* The other thermometer must be perfectly shaded and dry. The temperature of both thermometers should be noted in the register when the wetted thermometer refuses to sink lower.

The depression of the wetted thermometer below the dry one affords the best measure of the momentary evaporating power of the air. Evaporation is so much more rapid, and consequently the cold so much more considerable, as the air becomes less impregnated with moisture. Supposing the air to be saturated with moisture, there would not be any evaporation from the wet bulb, and they would obviously both mark the same temperature.

THE PHOTOMETER AND ÆTHERIOSCOPE

Should be used as often as convenience will admit of. The theory of the photometer hangs on the supposition that the intensity of light emitted from any body is always proportional

to the temperature excited by its incidence on the blackened ball. Observations should always be made with this instrument in the open air; and the effect of the direct rays of the sun, and indirect reflection from the sky noticed.

As a measure of the intensity of undecomposed solar light, Mr. Leslie, the inventor, says, "The photometer exhibits distinctly the progress of illumination from the morning's dawn to the full vigour of noon, and thence its gradual decline till evening spreads her sober mantle. It marks the growth of light from the winter solstice to the height of summer, and its subsequent decay through the dusky shades of autumn; and also enables us to compare, with numerical accuracy, the brightness of different countries—the brilliant sky of Italy, for instance, with the murky air of Holland."

At the summer solstice in England the direct impression of the sun's rays equals from 90° to 100° of this instrument; at mid-winter the force is only 25° or 28°. In very gloomy weather the photometer rarely indicates less than 10° at noon in summer, and barely exceeds a degree in winter.

The Ætherioscope of Leslie is intended to indicate the cold pulses emanating from the sky, *i. e.*, by giving a comparative idea of the radiation proceeding from the earth's surface toward the region of perpetual congelation in the atmosphere. The two balls are protected from the influence of the sun's rays by a brass covering. When this cover is on, the liquid remains at 0; on removing it, and the instrument presented to a serene or clear sky, in the day or at night, the fluid begins to rise, and continues to do so until the ball in the centre has sustained the greatest diminution of temperature which radiation at that time can produce.

Dr. Wells, in his treatise on Dew, points out the circumstances most favourable to its deposition; and this instrument is a valuable indicator of this favourableness. Such is its extreme delicacy, that when the liquid is rising, its progress is checked by the intervention of the smallest cloud; and by passing the edge of a parasol several times over it, when there is a clear sky, it will be kept in a state of oscillation.

THE DIFFERENTIAL THERMOMETER.

This instrument is the invention of the same gentleman as contrived the photometer and ætherioscope, and was used by him in his investigations on heat. Its principal use to the meteorologist is to make experiments on the light and heat of the moon, &c., by concentrating its rays by a lens upon the sentient ball. This can only be done when the moon is on the meridian. It is peculiarly adapted for measuring the effect of radiation.

PLUVIOMETER, OR RAIN GAUGE.

The most efficient instrument for ascertaining the amount of rain falling upon a given part of the earth's surface, is the self-registering pluviometer of Crossley. It consists of a rectangular funnel or receiver, ten inches square; meter, and set of counting wheels, with dials attached. Ten inches is the extent of ground on which the rain registered falls. The meter is a double trough, or water balance, having its sides at right angles. The rain which falls in the funnel passes through a pipe into the part of the trough that is uppermost, which, when full, sinks down, or loses its balance, empties its contents, and runs through the escape-pipe, having previously registered the amount on the dial. The trough, which before was lowermost, now becomes uppermost, and when full, discharges itself in like manner as the former, and so on alternately while the rain continues. Snow must, of course, be melted.

There are other gauges in use, as Howard's, Cumming's, &c.; yet as they require manipulation, the above is preferable. In stating the quantity of rain fallen by the gauge, the height of the receiver above the soil, and if known, above the mean level of the sea, should be mentioned on the register; experience having shown different elevations to give different results. The hour of reading off should also be stated.

As, however, many observers are so geographically situated as to be unable to obtain one of the kinds mentioned above, it may be well to suggest how he may manufacture one for himself. It should be in the form of a cylinder, with a funnel on the top, and made of copper or tinned iron plates. Across the cylinder a bar should be fixed, in the centre of which a socket should be placed, and another of the same size at the bottom of the funnel to admit the measuring-rod,—the lower one being the wider of the two, to admit the rain to pass through it. To the bottom of the float attach a float of cork. When the float is placed on the bottom of the cylinder, and the funnel over it, the top of the rod should be exactly level with the edge of the funnel. On placing the apparatus in an open situation, the rain received into the vessel will raise the float, and the rod being graduated into inches and tenths, will show the depth of rain which has fallen on a space equal to the area in the mouth of the funnel. It is evident when the funnel and cylinder have the same diameter, the rod must be divided exactly into inches and tenths; but, in proportion as the cylinder has a smaller diameter than the funnel, the divisions of the rod must be greater than inches and tenths. The diameter of the funnel should not be less than eight inches; twelve is preferable.

WINDS.

The real cause of the wind is at present unexplained, and requires very extensive data before it can be incontrovertibly asserted.* The following points respecting the wind are

* I say obscure, because there are as many explanations, or rather theories, of the cause of the wind, as there are changes in the phenomenon itself. Our observations on the direction and strength of the winds are, from the fewness of observers, very limited. All the circumstances attending or connected with the course of a gale should be noticed from the time and place where it commences until it expends itself. This can only be done by observers in *every line* over which it passes, and conclusions drawn from many years' experience. Mr. Redfield, of New-York, and Colonel W. Reid, Royal Engineers, Portsmouth, have set the example, which I doubt not will be followed by every meteorologist throughout the world.

considered by Sir John Herschel the most important to be known :—

1st. Its average intensity and general direction during the several portions of the day devoted to observation and registry.

2ndly. The hours of the day or night when it commences to blow from a calm, or subside into one from a breeze.

3rdly. The hours at which any remarkable changes of its direction take place.

4thly. The course which it takes in veering, and the quarter in which it ultimately settles.

5thly. The usual course of periodical winds, or such as remarkably prevail during certain seasons, with the law of their diurnal progress both as to direction and intensity—at what hours and by what degrees they commence, attain their maximum, and subside, and through what points of the compass they run in so doing.

6thly. The existence of crossing currents at different heights in the atmosphere, as indicated by the course of the clouds in different strata. In observing these it is desirable to fix the eye by some immoveable object, as some point of a tree or building, the sun or the moon ; otherwise mistakes are apt to arise.

7thly. The times of setting-in of remarkably hot or cold winds, the quarter from which they come, and their courses, as connected with progressive changes in their temperature.

8thly. The connexion of rainy, cloudy, or fair weather, with the quarter from which the wind blows or has blown for some time previous.

9thly. The usual character of the winds as to moisture or dryness, not as deduced from mere opinion or vague estimation, but from actual observation of the hygrometric state of the atmosphere during their prevalence.

THE ANEMOMETER.

The instrument used for ascertaining the direction and strength of the wind is called an Anemometer. Instruments of this kind

have been differently constructed by several ingenious persons. The most simple consists of a rod suspended like a pendulum, with a flat board instead of a ball at its lower extremity. It is obvious, that when the wind impinges upon such a board, it will, according to its strength, force it more or less out of a vertical position, and therefore the angle of deviation will be the measure of that strength. There is another contrivance, resembling a small wind-mill, by the number of revolutions of which, in a given time, the result desired may be obtained. The most perfect instrument for registering the wind in the absence of the observer is the anemometer of Professor Whewell. There is an excellent description of it in the "Transactions of the Philosophical Society, Cambridge, 1837." Both the direction and strength of the wind are marked with a pencil on an enamel cylinder. It is greatly to be regretted that its expense places it beyond the bounds of general use among meteorologists.

THE EUDIOMETER.

The eudiometer is an instrument used to ascertain the purity of air, or rather the quantity of oxygen contained in any given bulk of elastic fluid. We are indebted to Dr. Priestley for the construction of this instrument. The eudiometer of Dr. Priestley consisted of a glass vessel, containing an ounce-measure, filled with the air to be examined, by transferring it from a jar an inch and a half in diameter inverted in water. An equal measure of fresh nitrous gas was added to it, and the mixture allowed to stand two minutes. If the absorption were very considerable, more nitrous gas was added, till all the oxygen appeared to be absorbed. The residual gas was then transferred into a glass tube, two feet long and one-third of an inch wide, graduated to tenths and hundredths of an ounce measure; and thus the quantity of oxygen absorbed was measured by the diminution that had taken place. Volta had recourse to the detonation of air with hydrogen gas. Dobereiner has suggested the use of little balls of sponged platina for the purpose of detecting minute portions of oxygen in a gaseous mixture, in

which hydrogen is also present. Its effect is immediate and complete. The moment the substance rises above the surface of the mercury in the tube containing the mixture, the combination of oxygen and hydrogen begins; and in a few minutes is completed. Such is the energy observed in its action, that it enables hydrogen to take 1 of oxygen from 99 of nitrogen.

The principal use of this instrument to the meteorologist is in determining the influence of the phenomena of the atmosphere on the physical constitution, and before and after volcanic eruptions. See Article XI. among the subjects of research at the end of this paper.

CLOUDS.

The appearance of the sky, and apparent distribution of clouds, &c., is often very deceptive. The reader will therefore observe that it is only in that region of the sky directly over him, called the Zenith, in which the true form and outline of clouds are delineated, and the area they cover, can be seen rightly to distinguish them. As clouds approach the horizon in any direction, their extent is shortened by perspective, their magnitude diminished by distance, and the spaces between them hidden by their mutual interposition.

The changes of winds contribute to the formation of clouds and fogs;—the latter phenomenon is usually followed by a violent gale from the quarter nearly at right angles with that from whence the fog came. The distance of clouds from the surface of the earth differ greatly: thin and light clouds, as Cirri, &c., are higher than the highest mountains; thick and heavy clouds, as Stratus, Nimbus, &c., on the contrary, touch low mountains, steeples, and even trees.

The general aspect of clouds are classed as follows:—

Cirrus, or Curl Cloud, consisting of fibres, which diverge in all directions, commonly called mare's-tails: they forebode wind, and appear in the upper region of the atmosphere when the barometer is high.

Cirrostratus, or Wane-Cloud, is variously defined; it is generally seen as a low extended cloud, subconcave or undulated.

It sometimes consists in longitudinal streaks; at others it looks like shoals of fish; sometimes mottled, it is then called a mackerel sky; it appears frequently like muscular fibres, &c.

Cumulus, or convex and conical aggregates, which increase from a horizontal basis upwards; having their seat in the middle region of the atmosphere—generally the most condensed, and move with the stream of the air nearest the earth. Cumulus generally forms a few hours after sunrise, attains its maximum in the hottest hours of the day, and decreases and diminishes at sunset.

Cirrocumulus, or Sonder Cloud, is a congeries of small roundish little clouds in close horizontal apposition. It is not, however, always unifom in its appearance: it varies in the size and sphericity of its constituent nubiculæ.

Stratus is the sunken basis of Cumuli, of moderate density, and its lower surface generally rests upon the earth or the water. It is hence called the Fall Cloud.

Nimbus, or Rain Cloud, is accumulated layers of the stratus, which dissolving falls as rain.

The direction in which clouds are formed should be noted, and the different directions of the upper and lower strata entered on the register. If the sky is covered with white vapour clouds, of but little density, it is called glare; if much distorted, they may be denominated fleecy or light vapour clouds;—the extent these embrace should be stated on the register.

ELECTRICAL STATE OF THE ATMOSPHERE.

The electrical state of the air in serene and tempestuous weather has been too much over-looked by meteorologists. The atmosphere is generally found to be in an electrical state. The apparatus for these observations is simply a metallic rod, insulated at its lower extremity, elevated at some height above the ground, and communicating with an electroscope. When the amenity of the weather will permit, a kite should be raised, in the string of which a metallic wire should be interwoven; this will collect the electricity of the higher regions of the air. The atmosphere is usually found to be positively electrified; and its

electricity is stronger in the winter than in the summer, and during the day than in the night.

In cloudy weather, the electrical state of the atmosphere is much more uncertain; the electrometer should be frequently examined, and the kind of electricity at each discharge noted;—for when several strata of clouds move in different directions, the electrical state of the atmosphere is subject to great and rapid variations, changing from positive to negative, and *vice versa*, in rapid succession; especially on the approach of a thunder-storm, when strong sparks are sent out from the conductor.

ELECTRICAL PHENOMENA OF THE ATMOSPHERE.

To this branch belong "shooting stars," or any other electro-meteoric phenomena. Their appearance, direction, apparent elevation, length of path, and course among the stars, &c. &c. should be particularly noted. All the circumstances attending the aurora borealis in its nature, extent, and influence on the magnetic needle, should likewise be noticed.

Hail and thunder storms of course will be entered in the register at the time of their occurrence. Thunder is supposed to be merely the noise produced by the motion of the lightning. It is particularly recommended that notice may be taken of lightning, not heard to be accompanied with thunder at the place of observation; the quarter of the horizon from whence it appears, and the extent it embraces.

At its first appearance, the thunder cloud is a dense mass, rising into the higher regions of the air,—the under or lower surface black, and nearly level, but the upper part arched and well defined. Clouds of this description increase in number and extend their arches. When grown to a great size, their lower surface is often ragged, and detached towards the earth, but connected with the rest. When they are much agitated, the rain generally falls in the greatest abundance, and if the agitation is exceedingly great, it usually hails.

Negative atmospheric electricity commonly precedes the appearance of fog, rain, snow, &c., sometimes to a considerable

amount, but afterwards undergoes frequent transitions from one state to the opposite, and finally the atmosphere becomes clear, and positive electricity predominates.

OBSERVATIONS ON THE TIDES.

These will be found very important in tracing atmospherical disturbances to their originating causes. The state of the barometer, as to rising or falling at the time of high and low water, with the range of the temperature, should be minutely observed and registered, likewise the state of the atmosphere, &c. &c.

In conclusion, I beg to impress upon the mind of every observer, that before transmitting meteorological registers, it is necessary to verify the *mean* results by repetition, *counting the days* in *each column*, on which observations are made, to obtain the *true divisor*, and if possible let one or more persons read it over, that any slight omission or error may be detected and remedied. If the observer should, for want of time or any other cause, be unable to reduce his observations, the committee will do what is required or deficient.

REMARKS ON THE SUBJECTS OF METEOROLOGICAL RESEARCH.*

THE great difficulty in the study of meteorology lies in the attainment of a knowledge of the laws by which its phenomena are governed. In bodies mechanical the laws of motion are first prescribed, and the several parts dependent on the action of each other are constructed in conformity thereto; but in astronomical or celestial bodies, or the development of natural phenomena, although governed undoubtedly by certain determinate and fixed laws, the *effects* of their motion first strike the eye, and leave their *causes* to be discovered by the penetration of genius. Had the connection between *cause* and *effect* been the subject of comparison and research by the first observers of phenomena, they would not have bequeathed to posterity those mystical and speculative explanations of the physical constitution of the atmosphere, its modification and changes. If we take a retrospect of the opinions which have prevailed respecting any phenomenon, whether extraordinary or unimportant, remarkable or insignificant, distant or near,—from the first introduction of philosophy into Chaldea until its decline in the Greek and Roman empires, and from its subsequent revival to the present time,—we shall find them to be as variable as their authors, and their speculations as opposite as the poles. This is

* For the better elucidation of the processes in the phenomena of nature, I am desirous of receiving from observers, in all parts of the globe, their observations and remarks on the geographical position and geological distribution of matter within their field of observation, together with observations on any of the phenomena of the atmosphere, from the remotest period to the present time. My object in soliciting the co-operation and contributions of distant observers, is for the purpose of determining the nature, phenomena, and effects of the seasons in different latitudes, and to execute the discharge of the arduous task imposed upon me, namely, the arrangement of "A Synopsis of Meteorology."—ROBERT CARR WOODS, REGISTRAR.

a humbling picture of the fallibility of man; it is as the cloud intervening between his brightest objects, or as the mist that surrounds his highest and most elevated position, obscuring from his vision what is above him; rendering indistinct the vale beneath him, and pourtraying obscurely the scenic display around his panoramic observatory: yet the value of truth, and the hope of discovering the hidden treasure, is sufficient to stimulate his researches amidst the mystified and abstruse passages to be found in the writings of the ancients, and to keep him clear of the prejudices of learning or of ignorance.

An observer must enter the field of meteorological enquiry and research unbiassed by the theories of others, uninfluenced by preconceived notions, and unaffected by the phantoms of a lively imagination. His determination should partake of the liberty and self-possession of Horace, "not to be carried down any stream, but when overcome by the force of reason and truth."

It is for us *to observe*, and leave others *to determine*—to state things in the order they occur, and to accumulate data by which others may confidently judge—to collect, that others may dispose of—to gather every thing useful in meteorology connected with the safety of the mariner, the prosperity of the farmer, the health of the invalid, and the comforts of the domestic, that the blessings of our discoveries may be distributed for the happiness and welfare of succeeding generations.

The practicability of our endeavours need not, I am fully persuaded, be a matter of doubt. With the zealous aid of patient observers judiciously located in every accessible region, having for their general guide the twelve subjects of research proposed by the Meteorological Society, such materials may be collected from the atmosphere, the ocean, and the geological strata, as will enable us to predicate phenomena more immediately relating to the earth with the same precision as eclipses are now calculated. Is this enthusiasm? Are the phenomena of the atmosphere more uncertain in their approach, or eccentric in their duration, than the orbits of comets? Yet the re-appearance of these eccentric bodies was formerly considered uncertain; the length of their path was declared to be unknown, although now calculated with exactness.

Some weak-minded individuals, however, will be ready to say that our aim is too high; that it is above revelation; that it is contrary to the tenor of the Scriptures; that it will lead to a denial of the power, or even the existence of God! Far be such thoughts from our minds; it is the pleasure of the meteorologist to behold the grandeur of nature and the beauty of the universe, not as the work of nature, but of nature's God: he beholds the harmony which prevails; the truth each phenomenon reveals of the wisdom and power, the greatness and glory, the authority and beneficence of the Divine Being, in sending seed-time and harvest, summer and winter, to cheer the heart, and supply the physical necessities of our fleeting existence.

The phenomena of the atmosphere, though endless in the variety of their forms, and for the most part uncertain in the time of their occurrence, are successively the same in their nature as to parts or properties, &c., and are the productions of simple causes; for, as Sir Isaac Newton observes, "Nature is simple, and delights not in superfluous causes of things." The discovery of the cause of a phenomenon will not empower man to control it by the freedom of his will or the strength of his arm; nor will his knowledge place him beyond the influence of its effects. The desire of the meteorologist is rather to prepare against its destructive consequences by his foreknowledge of its approach. This may not be too much to effect, from the analogy of seasons, and the results of experience; and this we may venture to predict, will be the crowning reward of meteorological research. But the attainment of the data necessary for a precise system of calculation will be the work, probably, of centuries. At present our observations do not embrace one-millionth part of the lines and districts of the earth's surface; and until they do, "meteorological calculus" will be very obscure. We must, however, make a beginning. Let meteorologists throughout the world agree to think and act simultaneously, and the results will be obtained.

Before examining the phenomena around us, we should consider the phenomenon in which we dwell; its nature, properties, and use; and proceed step by step, until we attain the summit, whence we may trace the connection of celestial phenomena. What then is the constitution of the earth? Is it solid to its centre, and possessed of a uniform temperature?—or hollow, with

a central fire of three thousand degrees Wedgewood's scale? Which of the two theories, the Neptunian or the Plutonian, are correct, I leave geologists to determine. The circumstance is, at least, singular, that volcanic eruptions occur most generally when the temperature of the atmosphere is high.

As meteorological phenomena are not confined to the inferior region of the atmosphere, but extend as far as our observations have reached; it is possible their influence may extend universally, and therefore it is desirable to know whether there exists throughout space a medium or conductor, or whether there is such a thing in nature as a vacuum. Some have, it is true, endeavoured to reconcile opinions so diametrically opposed to each other, by suggesting that the universe, though infinite, is a plenum and a void! This, the doctrine of Leucippus, a recent author declares to be really true; and some conceive that the Newtonian theory necessarily implies the reality of a metaphysical void, although the astronomical calculations of that theory were made without any allowance for the resistance to the motions of the planets which might be experienced from such a medium.

Other circumstances depend on the existence of a medium or conductor; such are the phenomena consequent upon the aspects formed by the various planets composing the solar system. Without this etherial conductor, it is evident that planetary phenomena could not affect the earth's atmosphere. This part of meteorology is denominated ASTROMETEOROLOGY.

The foundation of this branch of the science is ascribed by Cicero to the Assyrians and Babylonians, and by other writers to the Indians and Egyptians. The Tyrian Cynosure of the Greeks, the "rainy Hyades," "the sweet influence of the Pleiades," and "loosing the bands of Orion," are terms familiar with the ancient prognosticators.

The observation of the time when aspects are formed, and the phenomena consequent thereon, in order to determine the effects of planetary influences on our atmosphere, are objects worthy of the attention of the meteorologist.

The science of botany is intimately connected with the study of meteorology. A falling or rising temperature, a diminished or increased pressure, or a greater or less amount of atmospheric electricity, affect the growth and health of plants. Some

flowers expand sooner or later, according to the cloudiness, pressure, or electricity present in the atmosphere.

Thus, the *Anagallis arvensis*, Linnæus, and the *Wincopipe* of Lord Bacon, have each been styled the poor man's barometer.

Horticulturists and agriculturists depend for success on the amenity of the weather, or the favourableness of the seasons: every indication of a change in the body of the atmosphere is observed by them with interest, and carefully noted, as the *atrox hora curriculæ*, the morning ray of Phosphorus, and the evening beams of Vesper.

Nor is navigation excluded from the advantages of meteorological discoveries. It may be enquired, of what use is meteorology to the mariner? I answer, much every way; chiefly it is *that* to his mind, which the telescope is to his vision. Compare the *Signum pluviate capellæ* of the ancients, with the Hygrometer of the moderns, or the setting of Arcturus and the rising of the Hoedi,—so often obscured from the eye by the midnight cloud, with the falling column of mercury in the tube of the barometer, on the approach of tempests; or contemplate the blessings the maritime world will receive when sufficient data having been collected of those destructive meteors, hurricanes and tyfoogns, he will be enabled to calculate upon unerring principles the time, course, and extent of these phenomena; and the important advantages of the science will immediately be seen.

In surveying meteorological phenomena, we are naturally led to enquire, Why do the winged tribes migrate from country to country? Why are the different species of animals affected in their movements? Why are invalids, flowers, and plants influenced by changes of the weather? And whence are the changes of the wind, the appearances of the clouds, the tints of the sky, the gambols of the fishes, and many other phenomena passing before us in review from day to day? Surely these effects are not produced by chance, nor are they the result of indefinite laws. Harmony prevails throughout the handywork of the Creator and Governor of the universe, by whom nothing was created in vain, and who still reigns and rules, holding the winds in the hollow of his hand.

SUBJECTS OF RESEARCH.

I.

To determine the mean temperature of the several seasons of the year, and also of the whole year, at various stations on the surface of the globe.

As temperature appears to be the apparent cause of many of the phenomena of production and growth in the natural world, and of the convulsions in the physical, its mean determination is of the highest importance. Whether heat is derived immediately from the sun, or produced by the influence of the action of the solar atmosphere on those of the planets, is a subject yet to be considered. The question to be determined here, is the effect of calorific influence.

The several seasons of the year, which bring, at their accustomed periods of return, heat and cold, verdure and nakedness, leave the most sensible impressions on our minds of the genial approach of spring, the warmth and majestic scenes of summer skies, the leaf-falling time of autumn, and the gloomy air and sterile aspect of winter.

The great advantage of ascertaining the mean temperature of the several seasons, will be the preservation of grain, plants, and vegetables, &c., by adopting such means as will keep the soil and strata of air near the earth coincident with the mean temperature of the seasons.

The mean temperature of the days the sun is in each sign of the zodiac should also be ascertained. The arrangement of stations, the manner in which observations are to be conducted, and the precautions necessary to be observed, will be found in the " Directions for making Meteorological Observations, &c."

II.

To mark the daily progression of temperature, and ascertain the form of the daily thermometric curves, (also at various stations,) and from them determine the two periods in each day at which the mean temperature occurs at each station.

In the attainment of this and the former object, some

difficulty presents itself in regard to differences of time or longitude, which, in stations at a considerable distance from each other, would be earlier or later according as they were east or west of the place of reckoning. Consequently contemporaneous observations are of no service excepting where the difference of longitude is small, or at stations near to each other, for determining the climate of local districts. We must therefore content ourselves with the daily thermometric curve according to the reckoning of time at the place.

III.

To determine the mean barometric pressure for any given period, as a day, month, &c.

Simultaneous observations will alone determine the mean barometric pressure. In this particular it therefore differs greatly from temperature. There are *two* means, *local* and *general.* To obtain the former, observers should agree among themselves to fix a certain number of hours daily, say three or four, as convenience will admit of, to record the state of the barometer, and thus determine the local mean pressure. The latter or *general* mean must be obtained by another series of observations actually simultaneous. This will furnish us with true data of the disposal of portions of the atmosphere from one place to another, when the balance of the atmosphere is destroyed, as indicated by the sudden and great rise or fall of the mercury in the tube of the barometer. The attainment of this object will be of considerable importance to the husbandman and the mariner, who, on perceiving one scale overbalancing the other, may prepare for the results consequent thereon.

The temperature should invariably be read off and registered, in determining the mean *local* pressure, that the *general mean* may determine whether pressure is affected by temperature or not.

IV.

To mark the various atmospheric phenomena, and the weather immediately preceding and succeeding each occurrence.

These being *effects* for the discovery of whose *causes* the researches of the meteorologist are devoted, they should be

noted with great particularity. It includes not only the ordinary phenomena of the atmosphere, as fog, dew, the quantity of blue sky, distribution of clouds, &c., &c., but likewise extraordinary or unusual phenomena, as meteors, halos, auroræ boreales, &c., &c. The sighing of the wind in the trees, the solicitous murmurs of the waters, and the refraction of the atmosphere, although they appear to be of trifling importance, should also be recorded.

v.

To register the direction and strength of the wind at numerous stations, and to ascertain the forms of the anemonal curves peculiar to certain latitudes, seasons, &c.

Wind is the air put in motion by some cause, upon which meteorologists are not yet agreed. It is perhaps the most difficult problem in meteorology,—at least it appears to me so. Its obscurity arises from the absence of the data required by the above proposition. A knowledge of local position, in order to determine how far it may influence the direction and strength of the wind, should first be considered. Thus when there is a *low wind,* an observer at an elevation of 70 or 80 feet may not experience even a gentle breeze, and another observer stationed at the distance of a mile or more, on a plain, may record the wind as a full gale. At other times it may be the reverse of this. An observer elevated 200 or 300 feet above the level of the sea, may experience almost a full gale; and an observer nearly at the level of the sea be unconscious of even a gentle zephyr—unless the wind commences in the vicinity of the former, when it frequently rolls down the summit, and coming in collision with the local current of the latter, vents its rage on all its opposing objects. The place of observation should therefore be distinctly stated.

I think water a better conductor of wind than land, by its yielding, as it were, to its pressure, or directive force; thus standing masses of water, as lakes, &c., having no peculiar current of their own, receive one in the direction of and proportional to the wind. Hence also I conceive the destructive effects of the wind to be greater in and near islands than at sea: as in the West India, Canary, and Orkney Islands; but in passing

over Continents where the opposition or obstruction of land is more general, its violence is usually at its first place of entry; it afterwards becomes more weakened, and its effects more uniform, until finally it expends itself. Continued gales are more frequent in the western hemisphere than in the eastern; this probably arises from the greater amount and larger extent of water in the former than the latter.

To determine therefore the direction and force of the wind, and the curves peculiar to certain latitudes, seasons, &c., will be of vast importance to meteorology; as, first, data will be afforded to determine why certain latitudes have peculiar winds at the several seasons of the year, and *how* they are produced; and secondly, the real and simple cause of the mysterious phenomenon.

VI.

To ascertain the nature of the connection that exists between the anemonal, barometric, thermometric, hygrometric, and electric curves.

This of course is not to be performed by a single observer. They are the results of continuous and uniform observations compared with each other, that will afford data to the Meteorological Society to observe to what extent connection one with another exists in these curves. Might not this form rather the subject of experiment than observation? It occurs to me that it should.

VII.

To register the quantities of rain in various stations, and ascertain the distribution of vapour at various heights.

Here are two subjects inseparably connected with each other —the one easily obtained with ordinary care, but the other exceedingly difficult. As the quantity of rain registered will depend upon the position of the Pluviometer or rain gauge above the earth and the level of the sea, it should therefore be noted at different elevations. A high wind will cause the rain to fall over the gauge and the apparent quantity or the amount registered by the gauge will be less than the real. Experiments should be made with a gauge in the form of a bricklayer's hod,

and placed upon an anemoscope, like a vane, to present an open face to the wind.

The distribution of vapour at several heights, is a subject so exceedingly difficult, that until we possess instruments better adapted than those at present in use, I shall almost despair of the amount ever being accurately ascertained. Yet the importance of the subject, and the difficulties connected with it should not discourage us in endeavouring to ascertain it, but rather prompt us to its discovery.

Terrestrial evaporation is highly electrical, both in its nature and effects, and is supposed by Professor Forbes to be the grand contributor of electricity to the atmosphere. Chemical evaporation is the effect of heat; natural evaporation goes on under every degree of cold. I am therefore inclined to differ with the learned professor who considers it the effect of heat only. Were it an effect of calorific influence simply, it should be, if not wholly suspended, very limited when the earth is to some distance frozen, and the temperature of the atmosphere below the freezing point; as in Norway, Greenland, Russia, and the Arctic regions: may it not rather be the effect of the conjoint action of heat and electricity? The phenomenon of evaporation is greater in summer than in winter, in the day than in the night. This may be accounted for by the greater amount of heat and electricity in the summer, and in the daytime, than in winter, or at night, when both forces are more limited in their influence.

In mountainous or rocky districts, the geological bases should be ascertained, as some elevations attract, and others repel vapour. Experiments should be made on the evaporating power of trees and plants in the neighbourhood of the observer.

VIII.

To determine the moon's influence on atmospheric phenomena.

That this luminary of the night must exert an influence on the phenomena of our atmosphere, is, I think more than speculative. If its influence produces the tides, why should it not affect the pressure and other phenomena of the atmosphere? at spring tides (which commence 60 hours before new and full moon,)*

* My observations were confined to Ramsgate. They are now made at London.

the barometer generally rises; at low water, the vacancy is generally supplied with air from the adjacent land, and at neap tides rain usually follows.

The light of the moon is supposed to have no effect on our atmosphere: this has yet to be determined. The thermometer has been observed to fall 5 or more degrees at the time of an eclipse. After new and full moon in winter, I have found the temperature of the sea increased.

Possibly the moon may exert but little influence herself, than as she forms aspects with the planets; future observations may determine how far the lunar action is connected with atmospheric phenomena.

IX.

To investigate the laws of rain, hail, fog, mist, dew, and the crystallization of snow.

The *nature* of these phenomena will be discovered by their *effects*, and that will determine their *causes*. The secret sources of these phenomena will, I think, be discovered chiefly from electrical observations. The electricity of the atmosphere has been much overlooked by meteorologists. So long as the equilibrium of atmospheric electricity is maintained in the regions of the atmosphere, the formation of rain, mist, &c. is progressing, but when the one overbalances the other by an addition to its positive or negative force, crystallization becomes rapid, and is developed according to the manner and amount of its action.

X.

To investigate the phenomena of storms, hurricanes, whirlwinds, &c., and trace them to their originating causes.

I have at proposition V. stated the obscurity which prevails concerning the source of the winds. In investigating these phenomena, we should ascertain the time of their commencement,—latitude and longitude of the place of entry,—the particular changes in their direction, force, &c.,—the *crisis*, or maximum strength,—the height of the barometer and thermometer before, during, and after their occurrence, and the general character of the weather during their continuance. These data

will put us in possession of a number of facts connected with these phenomena, and will enable us to trace them to their originating causes.

XI.

To determine how far atmospheric phenomena are influenced by volcanic, electric and magnetic action.

This of course must be left for the determination of succeeding ages, from the observations of those who have gone before them; especially the former, it being of less frequent occurrence than either of the latter. The particulars should therefore be stated with great preciseness at the time the phenomena occur. The eudiometer, barometer, electrometer, &c., should be particularly noted, as also the deflective and horizontal force of the magnetic needle, &c. &c.

XII.

To form local histories of climate, to state the prevalent diseases at each station for every month, and to determine how far they are influenced by atmospheric action.

To effect a subject so important to every class and constitution of life,—to humanity,—to commerce,—to society,—to physical and moral improvement, every nerve should be strained, every means used, and the best energies of every observer exerted, What is there more important to our convenience and comfort than a knowledge of the climate in which we dwell,—the diseases to which we are subject, by inspiring the humid or pestilential atmosphere,—its influence on our nerves,—its governance over our minds, and the direction it gives to the subjects of our mental pursuits?

These histories of climate will illustrate the truth of that sympathy which exists between the mind and the body: whatever affects the nerves of the body, from its peculiar sensibility to electrical or other atmospheric influence, must influence the mind, and occasion it to be more or less lively or dull, according to the impression it receives from the nerves, which, having their origin in the brain, "the seat of the mind," convey to it ideas of external things. From these circumstances we may perceive

how far the clear sky of Italy, and the murky air of Holland,—the warmth of the south, and the cold of the north, influence the manners, the taste, the cultivation of literature, and the advancement of the sciences among their respective inhabitants.

The number of epidemical diseases is, I think, greatly increased, although their dangerous effects are considerably ameliorated. They appear to arise from the want of uniform action in the electric fluid, and are confined to the less elevated parts of the earth, as the cholera morbus, influenza, &c., &c. Inflammations, coughs, and even rheumatism are more frequent when this fluid is rapidly changing from one state to the other.

The attainment of this and the preceding subjects of meteorological research is what the Meteorological Society was established for; yet of themselves they find they can do but little: it is unanimity and co-operation in observing and registering these phenomena that will afford the necessary materials for erecting the beautiful structure of meteorological science, of which every country and clime are but as parts of a magnificent and entire edifice, whose tower reaches the starry veil of the universe, and where the inhabitants are governed by its determinate laws.

It would be well for the government of every country to appoint in each town meteorological stations, where the particulars of phenomena would be recorded with the precision of the ordnance surveys of Great Britain and Ireland.*

The determination of the mean temperature and pressure of the air, the source of atmospherical phenomena, and their influence on the health, happiness, and prosperity of the people are subjects not to be disregarded and lightly considered.

* Since writing the above, I have received the bulletin of the Royal Geographical Society of Paris, containing an account of the "Meteorological and Magnetic Observations made throughout the Russian empire," by order of the Russian Government, and published by A. S. Küpffer, of the Academy of Sciences, St Petersburgh. A similar course of observations I hope will be followed by the British and other Governments.—May 2nd, 1838.

II.

REMARKS ON THE PRESENT STATE OF METEOROLOGICAL SCIENCE.—BY JOHN RUSKIN, Esq., OF CHRIST-CHURCH COLLEGE, OXFORD.

The comparison and estimation of the relative advantages of separate departments of science, is a task which is always partially executed, because it is never entered upon with an unbiassed mind; for, since it is only the accurate knowledge of a science which can enable us to perceive its beauty, or estimate its utility, the branch of knowledge with which we are most familiar, will always appear the most important. The endeavour, therefore, to judge of the relative *beauty* or *interest* of the sciences, is utterly hopeless. Let the astronomer boast of the magnificence of his speculations,—the mathematician of the immutability of his facts,—the chemist of the infinity of his combinations, and we will admit that they all have equal ground for their enthusiasm. But the highest standard of estimation, is that of utility. The far greater proportion of mankind, the uninformed, who are unable to perceive the beauty of the sciences, whose benefits they experience, are the true, the just, the only judges of their relative importance. It is they who feel what impartial men of learning know, that the mass of general knowledge is a perfect and beautiful body, among whose members there should be no schism, and whose prosperity must always be greatest, when none are partially pursued, and none unjustly neglected. We do not, therefore, advance any proud and unjustifiable claims to the superiority of that branch of science for the furtherance of which this Society has been formed, over all others; but we zealously come forward to deprecate the apathy with which it has long been regarded, to dissipate the prejudices which that apathy alone could have engendered, and to vindicate its claims to an honourable and equal position, among the proud thrones of its sister sciences. We do not bring meteorology forward as a pursuit adapted for the occupation

of tedious leisure, or the amusement of a careless hour. Such qualifications are no inducements to its pursuit by men of science and learning, and to these alone do we now address ourselves. Neither do we advance it on the ground of its interest, or beauty, though it is a science possessing both in no ordinary degree. As to its beauty, it may be remarked that it is not calculated to harden the mind which it strengthens, and bind it down to the measurement of magnitudes, and estimation of quantities, destroying all higher feelings, all finer sensibilities: it is not to be learned among the gaseous exhalations of the deathful laboratory; it has no dwelling in the cold caves of the dark earth; it is not to be followed up among the charnel houses of creation. But it is a science of the pure air, and the bright heaven; its thoughts are amidst the loveliness of creation; it leads the mind, as well as the eye, to the morning mist, and the noon-day glory, and the twilight cloud,—to the purple peace of the mountain heaven,—to the cloudy repose of the green valley; now expatiating in the silence of stormless æther,—now on the rushing of the wings of the wind. It is indeed a knowledge, which must be felt to be, in its very essence, full of the soul of the beautiful. For its interest, it is universal; unabated in every place, and in all time. He, whose kingdom is the heaven, can never meet with an uninteresting space,—can never exhaust the phenomena of an hour: he is in a realm of perpetual change,—of eternal motion,—of infinite mystery. Light and darkness, and cold and heat, are to him as friends of familiar countenance, but of infinite variety of conversation; and while the geologist yearns for the mountain, the botanist for the field, and the mathematician for the study, the meteorologist, like a spirit of a higher order than any, rejoices in the kingdoms of the air.

But, as we before said, it is neither for its interest, nor for its beauty, that we recommend the study of meteorology. It involves questions of the highest practical importance, and the solution of which will be productive of most substantial benefit to those classes who can least comprehend the speculations from which these advantages are derived. Times and seasons, and climates, calms and tempests, clouds and winds, whose alternations appear to the inexperienced mind the confused consequences of irregular, indefinite, and accidental causes, arrange themselves before the meteorologist in beautiful succession of undisturbed

order, in direct derivation from definite causes; it is for him to trace the path of the tempest round the globe,—to point out the place whence it arose,—to foretell the time of its decline,—to follow the hours around the earth, as she "spins beneath her pyramids of night,"—to feel the pulses of the ocean,—to pursue the course of its currents and its changes,—to measure the power, direction, and duration of mysterious and invisible influences, and to assign constant and regular periods to the seed-time and harvest, cold and heat, summer and winter, and day and night, which we know shall not cease, till the universe be no more. It may be thought we are exaggerating the effects of a science which is yet in its infancy. But, it must be remembered, that we are not speaking of its attained, but of its attainable power: it is the young Hercules, for the fostering of whose strength the Meteorological Society has been formed.

There is one point, it must now be observed, in which the science of meteorology differs from all others. A Galileo, or a Newton, by the unassisted workings of his solitary mind, may discover the secrets of the heavens, and form a new system of astronomy. A Davy in his lonely meditations on the crags of Cornwall, or, in his solitary laboratory, might discover the most sublime mysteries of nature, and trace out the most intricate combinations of her elements. But the meteorologist is impotent if alone; his observations are useless; for they are made upon a point, while the speculations to be derived from them must be on space. It is of no avail that he changes his position, ignorant of what is passing behind him and before; he desires to estimate the movements of space, and can only observe the dancing of atoms; he would calculate the currents of the atmosphere of the world, while he only knows the direction of a breeze. It is perhaps for this reason that the cause of meteorology has hitherto been so slightly supported; no progress can be made by the enthusiasm of an individual; no effect can be produced by the most gigantic efforts of a solitary intellect, and the co-operation demanded was difficult to obtain, because it was necessary that the individuals should think, observe, and act simultaneously, though separated from each other, by distances, on the greatness of which depended the utility of the observations.

The meteorological Society, therefore, has been formed, not for

a city, nor for a kingdom, but for the world. It wishes to be the central point, the moving power, of a vast machine, and it feels that unless it can be this, it must be powerless; if it cannot do all it can do nothing. It desires to have at its command, at stated periods, perfect systems of methodical, and simultaneous observations; it wishes its influence and its power to be omnipresent over the globe, so that it may be able to know, at any given instant, the state of the atmosphere at every point on its surface. Let it not be supposed that this is a chimerical imagination—the vain dream of a few philosophical enthusiasts. It is co-operation which we now come forward to request, in full confidence, that if our efforts are met with a zeal worthy of the cause, our associates will be astonished, *individually*, by the result of their labours in a body. Let none be discouraged, because they are alone, or far distant from their associates. What was formerly weakness, will now have become strength. Let the pastor of the Alps observe the variations of his mountain winds; let the voyager send us notes of their changes on the surface of the sea; let the solitary dweller in the American Prairie observe the passages of the storms, and the variations of the climate; and each, who alone would have been powerless, will find himself a part of one mighty Mind,—a ray of light entering into one vast Eye,—a member of a multitudinous Power, contributing to the knowledge, and aiding the efforts, which will be capable of solving the most deeply hidden problems of Nature, penetrating into the most occult causes, and reducing to principle and order, the vast multitude of beautiful and wonderful phenomena, by which the wisdom and benevolence of the Supreme Deity regulates the course of the times and the seasons, robes the globe with verdure, and fruitfulness, and adapts it to minister to the wants, and contribute to the felicity, of the innumerable tribes of animated existence.

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III.

CONSIDERATIONS ON THE PRINCIPLES, GENERAL BEARINGS, AND UTILITY OF METEOROLOGY; WITH SOME ACCOUNT OF ATMOSPHERIC ELECTRICITY. BY LIEUT. R. J. MORRISON, R.N.

The present state of science in general is remarkable for features of practical utility; for even the most speculative of all admitted sciences—Geology—bears strongly towards the point of utility to the arts, and while it gratifies the imagination by its shadows of past worlds of living and sentient beings, and its systematic changes in the order of mundane creative wisdom, it no less excites the hopes of advantages to the art of mineralogy. But hitherto there has been less of practical usefulness in meteorology than in other sciences, for the reason, that it has required a very long series of observations to arrive at any certain and determined data whereon to establish its principles. The recent developments of chemical science, but more so those of the science of electricity, have opened a door to the science of meteorology, as far as its principal object, the knowledge of the modifications of the atmosphere, is concerned, to make a more rapid march henceforward.

Perhaps the original ideas of the leading features of atmospheric phenomena—pressure, and temperature, as they were received by former meteorologists, may have been too exclusively attended to, to the neglect of other considerations, and this may have tended to retard the practical knowledge of the real causes of meteorological phenomena.

Temperature especially has been considered almost exclusively as the leading feature in the causes of atmospheric modifications, and we find that in his report on meteorology, contained in the second report of the British Association, Professor Forbes declares, that "most of all is the science of heat the very basis of all accurate knowledge on meteorology." May not this

have led to too confined a view of the causes of meteors generally? May it not, in fact, be questioned whether some meteors do not exist in apparently the same ratio, under very *different* circumstances of temperature? The writer named, whose able researches in geology and other sciences rank him high in the scientific world, and whose judgment it would be presumptuous in me to question, declares, when speaking of a knowledge of the laws of heat, that "to attempt to study meteorology without it, is like trying to read a cypher without previously mastering the key." But I rather feel inclined to submit, that heat is not the original *cause* of many of the various meteors in the true sense of the word, but is rather an *effect* of some other cause, and should be so considered, and is frequently distinct from those meteors, though concomitant therewith. It may not be denied that the meteor of *wind* occurs both from the same point and from the opposite point of the compass, at times with a rising, and at others with a falling temperature. But if a N.W. wind, for instance, be attended with a fall in the temperature, as it frequently is, and be therefore supposed to be produced by the colder air of the countries from which it comes, passing to the more heated air of more southern parts, how are we to account for the very general (though not infallible) fall of the temperature, when the wind sets in from the S.E. quarter, and brings us that heated air, or, at any rate, does not bring us air from a colder region? Again, as it is thought the heat of the S.W. wind is occasioned by its passing over the Atlantic,—the moisture of its particles being considered a consequence,—how is it that the same effect is not produced in America, when the N.E. wind arrives from over the same Atlantic? I think that if we make allowance for local causes of variation, it may be considered that in the northern hemisphere a general result of N.E. winds is cold air, and of S.W. winds, warm air. But I do not think that this can be satisfactorily accounted for solely upon the principles of calorific action, or the conducting of heat from one region to another; on the contrary, I question whether it will not eventually be proved that these, and all other winds, are caused by modifications of temperature and density of the atmosphere, and not *these* by the winds. So that we should not say, "it is cold because the wind is from the N.E.," but "the wind is from the N.E. because the air is cold;" and therefore that

the wind is not the cause of the low temperature, but the low temperature is the cause of the wind.

I am well aware that it is difficult to overcome early and general prejudices on this subject; but if we *consider* the subject, we may easily do so, and one circumstance may help to prepare us for the change. It is, that if the wind actually caused the cold,—being, in fact, merely the passage of cold air over any particular spot,—it should follow that the degree of cold would be in the same ratio as the force of the wind, which is not the case.

I could desire to draw attention to the enquiry of, whether atmospheric temperature be not dependent on two things; the calorific rays of the sun acting *variously*, according to the angles they make with the surface on which they fall, such angles being in part produced by the various degrees of refraction produced by the various densities of the atmosphere;* and secondly, by the activity of the electric fluid in its passages to and from the earth. In speaking on the subject of this fluid, Professor Forbes observes, "one great question is the source of the vast amount of electricity which seems, as it were, perpetually created in the atmosphere;" and which he goes on to attribute to vegetation and evaporation; but certainly the former of these causes is wholly absent at sea, where, nevertheless, the amount of atmospheric electricity is equal to that on land. Does it not seem more rational to refer its source to the origin of that which we know to be intimately allied to it in nature, I mean the solar light? This is found everywhere; and if the calorific rays of the fountain of day produce heat in all parts of the world, why should not its electric rays produce electricity?

Geologists appear to embrace the hypothesis, that central heat may have some effect on atmospheric temperature; but with due deference to the opinion of some learned geologists, I acknowledge that I cannot see my way clearly to this geological *primum mobile.* That the earth may have *absorbed,* and does retain a great degree of caloric, I can readily believe; but the idea of any other *first cause* of heat than the sun itself, (as regards all the bodies of the system of which it is the centre,)

* "Calorific rays decrease proportionally to the sines of the angles they make with the radiating surface."—REPORT ON METEOROLOGY.

I see no ground whatever to adopt. It was the first rule of the great Newton that, in our researches into the constitution of the universe, "no more causes are to be admitted than what are sufficient to explain the phenomenon."

Now, I think that in the action of the sun's rays we have "sufficient causes" to account for the phenomenon of atmospheric temperature without going "under the bottom of any great ocean" to look for others. And if I have named also the activity of the electric fluid, I would be understood to intend by that fluid a medium through which, or upon which, those rays act. And if it were here objected by geologists, that "heat from below invades newly-deposited strata, causing them to expand, melt, &c.," I beg to reply, that this is begging the question; for, to my mind, there is no evidence of any such fact; and I rather conceive that it is more consonant with reason to believe that an agent we do see, and the stupendous powers of which we do know, such as the electric fluid, is sufficient to explain the phenomenon.

It has recently been discovered by Mr. Leithead, that the effect of an unequal state of temperature in *one* metal will deflect the needle; and he justly observes, that "this simple experiment teaches us what an incalculable quantity of the subtile fluid must be in constant *motion* around us."*

But if we reflect that the earth is in the situation of an isolated plate, and that one end of it, (that nearest the sun) is always *hotter* than the other, we may conceive very readily that the consequence must be an excitement and discharge of the electric fluid. And as the portion of the earth turned to the sun is continually varying both by its annual and diurnal motion, this excitement must become general, and these discharges occur in all directions. And if such be the case, then unequal temper-

* Mr. Leithead's account of this experiment is as follows:—"I first took a tin plate, and soldered to each end (near the edge) a copper wire; I supported this plate on a glass pillar. I then took a little cotton wool, and placed it on one of the extremities of the plate. I connected the apparatus with the Galvanoscope, by means of the copper wires, and then poured a little sulphuric æther on the cotton wool. As the æther evaporated, intense cold was produced at that end of the plate; and, as I anticipated, the needle was deflected. When the needle rested, the *heat of the hand* at the other end was quite sufficient to cause a *second* deflection."

ature, and its concomitant, various winds, must be traced to a *joint* action of the rays of the sun, and the electric fluid.

But, if the above hypothesis be correct, there will necessarily be with every important change in the various modifications of the atmosphere *concomitant changes* in the state of the electric fluid, where those changes in the atmosphere occur. Now this is exactly the case, as has been fully demonstrated by observations extended over many months at various parts of the kingdom, and made at various periods of the year.

The results of observations I have made by means of a magnet electrometer * are chiefly these:—

1st. When the air is *plus*, the north pole of the magnet deflects to the *east*. This is the case almost invariably in clear weather in the day time, except when *rain* or *mist* is about to ensue in the course of a few hours; when the barometer *falls*.

2nd. When the air is *minus*, the north pole of the magnet deflects to the *west*. This is the case almost invariably in thick *misty* or rainy weather, except when fair weather is about to ensue, both by day and night; when the barometer *rises*.

3rd. At the approach of storms the currents of electricity are greatly disturbed, and the magnet is much agitated, and will remain in a tremulous state, and vary or oscillate several degrees in a few minutes. The barometer *then falls* extensively.†

Professor Forbes, observes "the direction of the wind exerts an important influence on the height of the barometer."‡ But I question whether the variations in the pressure of the atmosphere be not a result arising from the action of those powerful electrical currents almost always to be found in the air; for we find it when there is *no wind;* and I think as it *precedes* the wind, we may presume that it is at least connected with the cause which *generates* wind. For several hours before a gale, the pressure increases, and the electric currents are found to increase to an

* This simple instrument is merely an ordinary atmospheric electrometer with the pith balls replaced by a small and delicate magnet; care being taken to place the instrument in the shade, away from iron, &c., and to *maintain the cement of electricity* into the magnet itself.

† Similar results have been observed with this instrument at Bahia and other places in the tropical regions, and also at sea.

‡ Report on Meteorology.

extraordinary degree. Hence we may deduce two arguments: first, that the former of these effects (the fall of the barometer) cannot be the result of wind which has not yet commenced; and secondly, that the pressure of the atmosphere is connected with its electrical condition. Also we may inquire whether the wind is not a consequence of that condition; since the intensity of the electricity is more decided in these cases than the atmospheric pressure.

As regards the general importance of meteorology, a few words may be offered. The interests of all classes of society are so completely involved in a knowledge of the various changes of the seasons and the modifications of the atmosphere, that it were almost to undertake to prove a self-evident proposition to shew the value of that knowledge. Whether we regard the question of public health and of individual suffering in the case of the invalid, or the prosperous cultivation of the earth by the agriculturalist, or the successful pursuits of navigation, on which commerce depends for its very existence, holding as it does in one hand the sinews of national resources, and on the other the stamina of manufacturing interests, there is no one science more deeply affecting the general peace, prosperity and happiness of the community. How often does the farmer expend his property to prepare a sacrifice for the elements in the crop, which a single week's difference in the period of the harvest may either ruin or bring home in perfection! How often does the merchant bring himself to ruin and involve thereby the happiness of thousands, who are connected with him by means of the manufacturer, by speculating in the various products of the earth, as cotton, corn, oil, &c. &c., the supply of which, and consequently the market price, depends almost entirely on the season, or on the temperature, it may be, of even a few days, or on the presence of a few hours' frost, or a week's rain! Yet it is to the successful cultivation of meteorology alone that we can look for guidance to provide against these and a thousand other public and even national evils; such as want of employment among the manufacturing classes, high price of coals from long frosts, increased expense of provisions, &c. &c. owing to inadequate supplies to the markets, arising from the farmer's ignorance of the nature of the season. Again, we find medical men fast hastening to the conclusion that epidemics are produced by atmospheric

causes,* which being better understood by the science I am treating on, may be at least prepared for, and their virulence reduced. But to bring meteorology to the rank of a practically useful science, we must no longer be content to register pressure, temperature and humidity; we must also observe and register *electricity;* and, not as heretofore, confining ourselves to mark the *effects* of the various atmospheric changes; we must endeavour to explore the *causes* of those changes,—whether they be confined to the body of the earth alone, or extend, as my humble opinion is, to a general, systematic and harmonious action throughout the whole solar system.

Cheltenham, 28th June, 1837.

* Mr. Rogerson, an eminent surgeon of Liverpool, has recently maintained, before the Medical Society of that town, that the epidemics of 1834, 5, 6, and 7, were caused by a prevailing *negative* state of electricity in the air, causing inflammation of the mucous membranes of the lungs and bowels. And this is certainly borne out by the fact, that during six entire weeks that the cholera raged in Liverpool, the mean of the electricity was 11° *minus*, without any *plus* electricity whatever.

IV.

ON THE NATURAL HISTORY AND PROBABLE CAUSES OF THE VERNAL WINDS OF THE NORTH OF ENGLAND, AS THEY PREVAIL IN WESTMORELAND.—BY THE LATE JOHN GOUGH, Esq. KENDAL.

The weather is very changeable about the time of the vernal equinox; for the fluctuating state of the barometer at this season indicates the frequent storms of wind, rain, or sleet, which agitate the air from every point of the compass. These storms are called the equinoctial gales, and they give way, in a short time after the sun has entered the northern signs, to a more settled state of the weather, during which the eastern winds of spring prevail. This change commonly takes place in the first or second week of April, at which time the atmosphere, after remaining in a humid state through winter, becomes comparatively dry. This sudden alteration is indicated by the hygrometer in a scientific manner, and the same thing is proved by occurrences which never fail to attract the notice of every one. The public roads grow dry, after having been wet and miry during the winter season. This change being periodical, in all probability gave rise to the common adage, that "A peck of March dust is worth a king's ransom." It is necessary to remark that this, and all our ancient proverbs relating to the weather, belong to the Julian Year, and not to that we use at present, on which account the vulgar observation is correct, because the seed-time formerly commenced in the latter half of March, or in the beginning of the modern April. Indications of the change in question are also given to vulgar observers by the doors, window-frames, and furniture in private houses, which undergo a perceptible alteration of figure in consequence of being deprived by the dry state of the atmosphere of a large portion of the water which they held by attraction during the moist season of winter.

The periodical winds of spring blow during this time of

drought; and they are perhaps the principal, if not the only cause that produces it; but more will be said on this subject in the sequel of the essay. These winds proceed from every point between the north and east, but for the most part incline more or less towards the latter quarter. They are commonly strong, but rarely violent during the day, and blow steadily, beginning after sunrise, and gradually dying away in the course of the evening. The nights, though calm, produce but little dew, but they are frequently frosty. During the prevalence of these vernal easterly winds, the barometer is high, that is, it stands generally above the annual mean of the place of observation. The temperature of the season is on the increase, of course, from the operation of natural causes, but the state of the vernal winds is such, that the breath of them pinches the limbs with intolerable cold, even when the sun shines brightly, and the thermometer stands between fifty and sixty degrees in the shade. The fact I have just stated shews that this pinching and benumbing quality of the vernal winds, is not occasioned by a deficiency of temperature in the atmosphere; on the contrary, it may be safely ascribed to the constitution of the air, which, being dry at the time, absorbs the moisture from the surface of the body as fast as it is supplied by perspiration, and thereby produces a degree of cold in the same manner that water and wines are cooled by evaporation in tropical countries. The foregoing explanation of the benumbing effects produced, by the vernal winds, is confirmed in part by an observation which I have made in common with other persons in ascending Skiddaw in very hot weather; for so soon as the traveller reaches the top of the mountain, he meets with a brisk and steady breeze, the keenness of which proves almost intolerable, although the temperature of the air is far from being low; but it is known by observations made with the hydrometer in journeys of this description, that the air is very dry upon the tops of high hills in fair weather, which circumstance inclines me to attribute the keenness of the wind, which blows on the summit of Skiddaw, to a want of moisture in the atmosphere. I do not wish to be understood that the periodical winds, under consideration, blow without interruption from the commencement to the time when they usually terminate. On the contrary, both the prevailing winds, and the droughty season, are

occasionally suspended by atmospherical causes, producing storms of wind, rain, and snow, which, like the equinoctial gales, blow from every point of the compass. These tempests are not uncommon about the middle of April, which agrees with the end of Julian March; and this circumstance in all probability gave rise to the following proverbial rhyme:—

"March borrow'd of April
Three days, and they were snill,*
The first rain'd, the second snew,
The third was worst that ever blew."

The irregularities which have been mentioned, break the general tenor of the weather, and change its character for a time, but they are of temporary duration; for they are produced by atmospherical causes, which soon lose their influence; after which the wind reverts to the north-east quarter, the barometer rises, and the drought returns. Such are the vicissitudes of the weather in Westmoreland during April, and they continue until the vernal winds die away. This event happens, apparently, not from an opposition of contradictory causes, but from the failure of that cause which gives rise to them. The change from a droughty to a mild and genial temperature of the air takes place before the end of April, in favourable years, but the severity of spring is prolonged not unfrequently into May. But when this desirable change arises, be it sooner or later, the hygrometer indicates a gradual increase of moisture in the atmosphere, and an agreeable temperature succeeds to the pinching cold of the vernal blasts. These are the prognostics of a gentle and warm wind from the south or south-west, accompanied with rain. So soon as this wind begins to blow, the latest birds of passage make their appearance; and vegetation advances rapidly; the trees are covered with foliage; the fields are clothed with verdure, and every sense and every heart is joy. It must be admitted that symptoms of spring are seen occasionally prior to the agreeable change which I have been describing; but the productions of a premature vegetation commonly perish soon after their appearance above ground, being destroyed by frost and drought. Perhaps this is the reason why established

* A provincial word importing cold.

custom has fixed upon the 25th of April as the proper time for clearing grass lands of sheep and cattle. The following proverb also alludes to the subsidence of the vernal winds, and at the same time it personifies the month not inelegantly :—

> "April with her hack and bill,
> Plants a flower on every hill."

The circumstances having been now stated which characterize the dry season under consideration, I shall therefore proceed to give a few theoretical remarks respecting its origin. Every phenomenon which is periodical, like the easterly winds of spring, must be ascribed to a cause equally periodical. In my opinion, the cause of these winds may be referred to the progressive advances of the spring from the south to the north. This season commences in Italy about the 20th of February; it is equally advanced in Westmoreland about the middle of April, at which time the countries situated on the confines of the Arctic circle remain buried in snow. This covering will unavoidably arrest the progress of spring in its advances towards the Arctic circle, and prolong a milder kind of winter in the northern regions. The delay here pointed out is certain and annual, because the solar heat, instead of warming the surface of the country thus buried in snow, is absorbed by the icy covering, and employed in converting it into water of the temperature of melting ice. While the sun is employed in removing this impediment to vegetation in the north, his beams are warming the plains and valleys of England, in consequence of which the thermometer in the shade frequently stands between 60° and 70° at noon during the latter part of April, and falls occasionally to the freezing point in the night. These facts shew that the inhabitants of Britain enjoy an advanced state of temperature, while the people of Sweden and Norway are exposed to a degree of cold equal to the rigours of our winters. The preceding difference in the temperature of the atmosphere of Britain, and the more northern regions, gives a greater specific gravity to the air of Sweden and Norway than to that of England, as well as to all the intervening countries which are free from snow; and this excess of density is, in my opinion, the cause of the vernal winds. The conjecture here advanced is not entirely hypothetical; because it

is confirmed by the laws of hydrostatics, which prove that when two columns of air of different specific gravities rest upon contiguous bases, the heavier will remove the lighter, and flow into its place. This is the reason of my conjecture, that the atmosphere of the north, which is kept dense by being in contact with snow, flows southward in a current which displaces the warmer and lighter air of England, and thereby produces the vernal winds. It is almost unnecessary to add that the direction of this current will depend principally upon the relative position of the relative tract of frozen land. In respect of the observer's situation, this frozen country must be that part of Europe to the north-east of Britain, including Sweden and Norway.

The foregoing theory of the vernal winds may be extended further, for it has been observed in the history of them, that they blow briskly during the day, but die away after sunset, being succeeded by calm nights, which are often frosty. Now, supposing the theory to be correct, these alternate changes in the weather during the early part of spring must take place of course, because the air of the south and north approaches in the night to an equality of temperature, and consequently to an equality of density; which circumstance diminishes the preponderance of the northern atmosphere, and thereby produces a comparative calm in most southern climates. I have supposed in the beginning of the essay the winds in question to be the principal, if not, the only cause of the drought which distinguishes the latter part of April. Perhaps this conjecture may seem to be improbable, because a body of air becomes very moist by remaining in contact with melting ice or snow. But it must be also recollected on the present occasion, that the air, which is saturated with water, may be rendered very dry and become capable of absorbing more humidity by an increase of temperature. The knowledge of this fact obviates that objection to this part of my theory: for the current of air which issues from the frozen regions in a moist state acquires but little temperature before it arrives upon the shores of Britain: because the north sea is much colder in spring than this island is: but as soon as the atmospherical current begins to blow over the warm lands; it also begins to acquire heat, and with it the power of dissolving more water. To this cause then, I venture

to attribute the dry weather of April, and the other droughty phenomena, which indicate the transition from winter to spring. In the first part of the present theory, I connected the origin of the vernal winds with the slow progress of the spring northwards; and I have only now to add that every successive advance of the season towards the Arctic circle, moves the cause of these gales further from us, and weakens their effects upon our country, until they die away of themselves, and leave the weather to the influence of those unknown causes which regulate the winds and barometers with more or less effect through every month of the year.

Kendal, Westmoreland.

V.

TEMPERATURE OF THE EARTH. — TRANSLATED FROM THE FRENCH OF M. QUETELET, SECRETARY OF THE ROYAL ACADEMY OF BRUSSELS. BY W. H. WHITE, ESQ., M.B.S., HON. SEC.

M. QUETELET shewed a part of the results which he has obtained from his observations upon the temperature of the earth at different depths, and during the course of the year 1836. It was only on the 20th of December last, that the thermometer, the bulb of which was placed at the depth of twenty-four feet, attained its *maximum* of elevation in consequence of the heat of the summer. The same thermometer attained its *minimum* the 14th of June of the same year.

The results of 1836, compared with those of the two preceding years, have presented the following dates for the period of the *maximum* temperature in the interior of the earth, from the surface to the depth of twenty-four feet:—

	Times of the highest Temperature.		
Depth	1834.	1835.	1836.
of 0·58 feet.	26th July.	2d Aug.	17th July.
1·38 „	4th Aug.	10th „	22d „
2·31 „	10th „	15th „	26th „
3·08 „	14th „	18th „	29th „
6·00 „	4th Sept.	8th Sept.	? *
12·00 „	8th Oct.	8th Oct.	10th Oct.
24·00 „	12th Dec.	3d Dec.	20th Dec.

The following Table shews how the cold of winter has been successively transmitted below the surface of the earth:—

* This thermometer was broken during the year 1836.

Depth	Times of the lowest temperature.* 1835.	1836.
of 0·58 feet.	17th Jan.	21st Jan.
1·38 „	24th „	23d „
2·31 „	10th Feb.	24th Feb.
3·08 „	18th „	26th „
6·00 „	19th March	?
12·00 „	20th April.	4th April.
24·00 „	16th June.	8th June.

Thus we have been able to determine that the mean time employed to ascertain the *maximum* and *minimum* temperature from the surface of the earth to the depth of twenty-four feet, has been about 144 days, which, for the velocity of the heat, is about one foot in six days.

In 1836, the difference of temperature of the hottest and coldest months has been 14° 9′ at the surface of the earth. This same difference has not been more than 1° 41′ at the depth of twenty-four feet.

Having shewn what have been the differences from the mean results of 1834, 1835, and 1836, we shall give in comparison with these observed results, the results calculated from the known formula.

$$\Delta p = Ae^{-pa},$$

from which we deduce
$\log. \Delta p = \log. A - pa, \log. e$, or $\log. \Delta p = a - bp$, Δp being the difference of the *maximum* and *minimum* temperatures at p feet of depth, a and b being two constant quantities.

Depth	Excess of the *maximum* over the *minimum* temperature of the year, nearly, By observation.	By calculation.
of 0·58 feet.	13·00	13·13
1·38 „	12·35	12·17
2·31 „	11·25	11·15
3·08 „	10·36	10·36
6·00 „	7·59	7·86
12·00 „	4·47	4·45
24·00 „	1·43	1·43

* The thermometers having been placed in the earth at the end of the year 1833, we were not able to determine the minima in a satisfactory manner for 1834.

The formula, by putting the values of the constants used in the calculation, being

$$\log. \Delta = 1{\cdot}14198 - 0{\cdot}04111\, p.$$

From this formula we find the difference between the hottest and the coldest months would not be more than

1° 0′	centigrade	to 29	feet depth.
0° 1′	,,	,, 52	,,
0° 01′	,,	,, 76	,,

To this last limit, we may look upon the annual variation of temperature as nearly made, and where it would have attained the bed of invariable temperature.

This value of seventy-six feet, or of 24·7 métres, is nearly the value which I have found for Paris, Strasburgh, and Zurich. It is only 17′ 8″ for Edinburgh.

M. Quetelet announced that M. Küpffer, who had intimated his intention of making analogous observations upon the temperature of the earth in Russia, had forwarded to him calculated results upon the co-efficient, which shews the earth's power of conducting heat.

These results are given in M. Küpffer's important work upon his travels in the Oural.

" You will find," adds M. Küpffer, " a discussion upon the observations made at Zurich, Strasburgh, &c."

The value of a (this is the co-efficient of your p, divided by the log. e, or by 0·43429) is at Brussells, according to your formula, equal to 0·0973 and 0·0887; my calculations are nearly

0·1554 0·1332	for Edinburgh.
0·0904	,, Strasburgh.
0·1102	,, Zurich.

Would not this value be greater in high than in low latitudes?

The observations at Zurich are not, however, favourable to that supposition. M. Quetelet stated that he had had the curiosity to make similar observations to those of M. Küpffer,

but his co-efficient for Zurich is more favourable to the hypothesis of the learned Russian philosopher than the preceding—while that calculated for Paris is contrary to it.

M. Quetelet thought that nothing satisfactory could be obtained on this subject, so long as the results of the observations were not corrected from the effects of the inequality of temperature in the whole range of the thermometer.

This portion of the physics of the globe may be considered as being yet new.

We scarcely possess any thing upon this interesting subject from the diurnal observations of the temperature below the surface of the earth from the observations made in 1836, at the Observatory of Brussells, but the difficulty of making these observations, and especially that of protecting the instruments in the open air, and in the garden, which is enclosed only by a latticed pallisading, has occasioned the loss of several of the most important thermometers.

The observations which have been collected are not, however, without interest.

London.

VI.

NOTICE OF THE METEORIC PHENOMENA AT FELDHAUSEN, SOUTH AFRICA, ON THE 13TH AND 14TH NOVEMBER 1837.—BY SIR JOHN F. W. HERSCHEL, BART., F.R.S., &c. EXTRACTED FROM A LETTER TO THE SECRETARY.

I WATCHED the nights of the 11th, 12th, and 13th November for meteors.* On the 11th it was cloudy; on the 12th the light of a full moon obliterated any which might otherwise have been seen, till about 2h. A.M., when it clouded over finally; the 13th it continued cloudy the whole night. The first entry of meteors subsequent, which I find is on the 16th, in which it is noticed that on that night a great many meteors were seen, and remarkably uniform in direction, one about every four or five minutes; nearly all crossing the meridian *from* Azimuth about 40° north of east, *to* Azimuth 40° south of west; many in low altitudes. One equal to a star of the first magnitude shot slowly in the reverse direction. One other (= * 2·3 m.) shot along the true meridian from S. to N.

Since that date they have been (as usual at this season) very numerous, and almost universally following the same law as to direction.

Feldhausen, C. G. H., Dec. 1st, 1837.

* At London, however, we had no meteors, but a most beautiful electrical phenomenon. In the United States the meteoric display was witnessed with the splendour of former years, the number of meteors observed amounting to 226.

VII.

ON THE METEOROLOGY OF THE ISLAND OF TENERIFFE.—BY LIEUT. GEORGE GREY, COMMANDER OF THE AUSTRALIAN EXPEDITION.

In the month of July 1837, I had an opportunity of visiting the island of Teneriffe, lying in latitude 28° 37′ N., and longitude 16° 15′ W. As I was aware that we should be unable to remain at this island for a longer period than three or four days, it was evident that any meteorological observations which I might have an opportunity of making would be, comparatively speaking, of but little value. I felt therefore desirous to ascertain if any individuals of scientific attainment had at any period taken a continuous series of thermometric or other observations.

I was the more desirous of obtaining some information upon this point, for as the island of Teneriffe is of volcanic origin, and as its famed peak is at the present moment, and has been since the island has been known to Europeans in the state of a Solfatara, I entertained a hope that if such a series of observations had been made, they might possibly throw some light upon the influence that volcanic action exercises upon atmospheric phenomena.

Upon enquiry, I found that a Dr. Savignon had made a series of thermometric observations during a period of eight years (from 1811 to 1818 inclusive) at Laguna, a town in this island situated three miles from the coast, and about 1800 feet above the level of the sea. A copy of the result of these observations is annexed.

The gentleman who made these observations is, I believe, now dead. I was therefore unable to obtain any of the actual observations, but merely the general results. The observations from which these results were deduced were made at three

periods of the day; but Mr. Richardson, the person who gave them to me, was not able to inform me what these hours were.

Although I did not entertain the least doubt as to the care with which these observations had been made, or as to the reliance which might be placed upon the results, yet I thought that it would be as well to obtain, if possible, even some rough standard of comparison. I have therefore transmitted copies of observations, made on board Her Majesty's ship Beagle during the five days she remained at Santa Cruz; the first of these sets were made in the cabin of Captain J. Wickham, R.N., and the other set in the shade upon the quarter-deck, the vessel lying at the time about a quarter of a mile from the shore.

They are as follows:—

FIRST SET.

		8 A.M.	2 P.M.	8 P.M.
Tuesday,	18th July	73° Fah.	73°¾	75°
Wednesday,	19th	74½	75	74¼
	20th	74½	75	76
	21st	74½	75¾	75¼
	22nd	74½	74¼	74½
Sunday,	23rd	75½	75¾	76½

SECOND SET.

Tuesday,	18th July	73½	75¼	77¾
	19th	76½	78	74¼
	20th	78¾	80¾	75¾
	21st	80½	80	75
	22nd	80½	78¼	75½
	23rd	77¼	78	75

These observations were made with two thermometers, one at each station, and were read off by the same individual. It will be seen that there is some discrepancy in the results; the first set giving a mean of rather less than 75° Fahr., and the second

a mean of rather more than 77° Fahr. The result of the two sets gives therefore a mean of about 76° Fahr., whilst the mean of eight years, for the month of July, obtained by Dr. Savignon, was from 68¾° to 69° Fahr.

In comparing these two results together, we find a difference of more than 7° Fahr. Yet it must be borne in mind that Dr. Savignon's is deduced from eight years' observations made during the whole month of July, and at 1800 feet above the level of the sea: whilst the result obtained on board the Beagle is from observations made during only five days, at the level of the sea, and in a season considered by the inhabitants to be a remarkably warm one. I do not think therefore that the difference between the two results, is, if these circumstances be taken into consideration, a very extraordinary one.

I was also able to procure a table of the quantity of rain which fell in each month of the years 1812 and 1813. There is one circumstance in this table worthy of remark. It will be seen that the rain which fell in January 1812 was 10·79, whilst the quantity which fell in January 1813 was only 3·34; but of the whole quantity of rain which fell in January 1812, 5·24 fell in the period of 24 hours. In fact, one of those dreadful storms occurred to which the Canary Islands are subject; another of these storms occurred in March 1837, and another in November 1826. I have annexed to this the official statement, which was on this latter occasion issued, of the damage caused by this storm in the island of Teneriffe, and from this document some conception may be formed of the fury with which these storms sometimes rage.

I have only to add, that as the observations of Dr. Savignon at Laguna extended over so long a period as eight years, I think we are justified in concluding, that the mean temperature of the whole year, as also of its several seasons, has been fully determined by this gentleman.

(Translation.)

The mean temperature of Laguna may be considered as 63° of Fahrenheit among the houses in the centre of the city, in the shade and in the open air, from the result of eight years'

observations never interrupted for a single day, from 1811 to 1818 inclusive.

January,	55 to 55½	
February,	56 „ 56	
March,	58 „ 58¼	
April	59 „ 59¼	
May	62 „ 62	
June	65 „ 65	
July	69 „ 68¾	62¾ mean of the eight years.
August	71 „ 71	
September	70 „ 70	
October	66 „ 66⅜	
November	62 „ 62	
December	58 „ 58	

RAIN WHICH FELL IN TWO YEARS, 1812 AND 1813.

	1812.	1813.
January	10·79	3·34
February	2·22	2·46
March	0·15	4·17
April	0·09	2·39
May	—	—
June	—	—
July	—	—
August	—	—
September	—	0·15
October	1·76	7·34
November	2·12	4·24
December	2·20	1·13
	19·33	25.22

In 24 hours in January fell 5·24.

In the night of the 7th to the 8th of November 1826, there was a tempest of wind and water, which did much damage in all the islands. The damage suffered in eight towns of the island of Teneriffe is shewn in the annexed statement:—

TEMPEST AT THE ISLAND OF TENERIFFE, ON THE NIGHT OF THE 17TH NOVEMBER 1826.

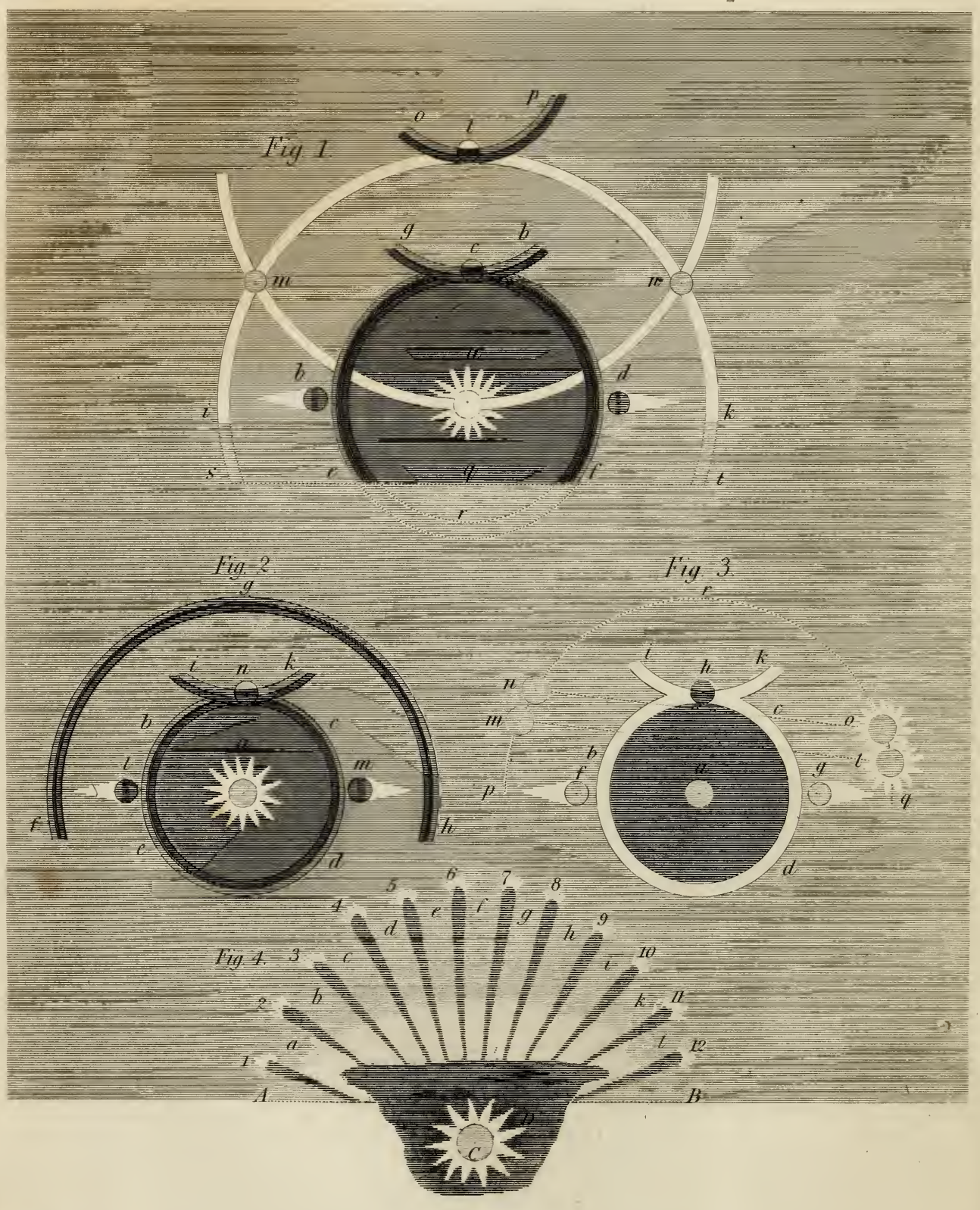
Towns.	Persons destroyed.	Houses destroyed.	Animals destroyed.	Houses ruined.
Villa de la Orotava	104	144	591	75
Puerto de la Cruz	32	31	23	6
Realejo de Arriba	25	41	—	—
Realejo de Abajo	14	9	—	2
Rambla	10	14	13	—
Ycod	5	—	—	—
Santa Ursula	1	—	32	—
Guancha	52	72	344	31
Total	243	311	1003	114

H.M.S. Beagle, Cape of Good Hope.

SOLAR AND LUNAR HALOS,

Parhelia, Paraselenæ, Antiheliæ, & Colored Lights & Shades

BEHIND CLOUDS.



Drawn by J. H. Maverly.

Engraved by F. P. Becker.

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VIII.

OBSERVATIONS ON SOLAR AND LUNAR HALOS, WITH THEIR ACCOMPANYING PARHELIA AND PARASELENÆ; ALSO ON TWO ANTHELIA.—BY J. H. MAVERLY, ESQ. GOSPORT.

On January 15, 1838, the day after the very hard frost, and an unusual diminution in the temperature of the atmosphere in this latitude, at half past 11, A.M. I observed a faint solar halo, fig. 1, *e b c d f*, just beginning to form in an apparently cloudless sky, and in two or three minutes after, a faint parhelion *b* on the eastern side of the sun *a*. This parhelion soon disappeared, but it was quickly succeeded by a coloured one *d* on the western side of the sun. The parhelion *b* reappeared with brilliant colours, red and blue, from the sun, and both of them were now so bright and well defined, not being much larger than the disc of the sun, as to enable me to measure the horizontal diameter of the halo with a sextant, by bringing *d* to coincide exactly with *b*, the angular distance was 45° 44′ nearly; but in order to be quite correct, I brought the reflected sun to exactly overlap the parhelion *b*, and the distance was 22° 50′. The lateral parhelia *b* and *d* had white conical trains from the sun four or five degrees long, which I imagined were produced by horizontal solar rays passing through or round the light vapour that must then have been about the halo. In looking round the halo, which was now tinged with light red internally, I observed another parhelion *c*, perpendicular to the sun, and at the vertex of the halo; this parhelion was also coloured, and in consequence of the intersection of part of another halo, whose arch formed horns *g h*, it was much larger, but not so well defined. I then brought the reflected sun to coincide with *c*, and the angular distance was 23° 10′, so that the perpendicular diameter of the halo was one-third of a degree greater than the horizontal.

The sun being now on the meridian, I found his true central

altitude to be 18° 2′ 30″. In looking attentively around I was rather surprised in seeing the upper part of a large halo *i l k*, which was colourless, excepting the vertex, where it was red. The horizontal semi-diameter of this halo was 45° 30′, nearly the same as the diameter of the interior and concentric halo *e b c d f*. At the points *m* and *n* the fourth and fifth parhelia appeared, at 15 minutes past 12, mean time, by means of the intersections of part of a large whitish circle *m a n* passing through the sun *a*, and of the same diameter as the exterior halo. I observed that repeated efforts were made to enlarge the deficient parts of these large circles, but either the extension of the planes of vapour, fine spiculæ of ice, or snowy crystals in which they were formed, seemed wanting. At the top of the exterior halo part of another *o l p* appeared with the sixth parhelion *l*, which was not white like *m* and *n*, but coloured, and must have been formed some minutes before I saw it, for the inverted part *o l p* was of a deep red colour, and measured from *o* to *l* 8° of a great circle, and from *l* to *p* 15°, and if it had been a complete halo, it would have been of the same diameter as the interior halo *e b c d f*.

The altitudes of the parhelia *b* and *d* were nearly the same as that of the sun; *m* and *n* were respectively of the same altitude as the one at *c*, that is 41° 17′ 30″; the upper one *l* was 63½ nearly; and the altitude of that part of the upper inverted arch at *p* was 79° nearly.

At 20 minutes past 12 the halos and parhelia were in their greatest perfection. It will be seen in the figure that as *e q f* represent the southern horizon, the halo *e c f* was only seen so far as *e q f*, and hence the dotted lines *e r f* are meant for its part below the horizon: also that the exterior halo *i l k* was complete only so far as *i k*, and the dotted lines *i s k t* are merely made to give the figure a more uniform appearance.

With regard to the disappearance of the phenomenon, the parts of the large circles, and the parhelia *m* and *n* went off first; *g c h* with the parhelion *c* next, and the parhelion *d* next to that: then *o l p* and the parhelion *l* disappeared, the parhelion *b* next; but the faint trace of the concentric halo *e b c d f* was intercepted by passing cirrus, followed by a dense cirrostratus cloud from the west at 31 minutes past 12 o'clock, so that the phenomenon lasted upwards of an hour. I have thought that a

dense spreading mist which rose from the sea between Gosport and the Isle of Wight, at half-past 10, A.M., may have had some agency in producing the phenomenon, as in its ascent it was wafted in different directions by several currents of air then prevailing.

During this extraordinary appearance the sun's rays were weak, and only raised the thermometer 3 or 4° above the freezing point. The temperature of the external air in the shade ranged from 24° to 25°; and finding it inconvenient to wear gloves while using the sextant, &c. the backs of my hands and fingers were shockingly cut and chapped by a strong piercing gale from the east. The pressure was 29·876 inches, and the mercurial column nearly quiescent.

The upper circles could not have been generated by reflection, otherwise they would have partaken of the same colours, which was not the case: neither do I think that the inverted arches were formed by reflection from one another, because they shewed different colours: indeed, it is difficult to account for such a complication of halos and parhelia, unless we conceive the former to be generated by refraction and reflection of solar light in differently inclined planes of vapour, or beds of snowy crystals at a moderate elevation in the atmosphere; and the latter, by a double refractive power at the intersections of the halos.

Among the great number of parhelia that I have attentively observed the last twenty years, I have frequently seen one, at other times two faint lateral ones, those on the sides of the sun, without any trace of a halo; but when they have displayed prismatic colours I have traced the halo, and particularly when three have simultaneously appeared at nearly equal distances from and about the sun.

Sometimes there are lateral parhelia when the atmosphere is in a slight state of condensation, that would evade the eye of an inexperienced observer, from their being colourless in, or at the edges of attenuated cirrostratus, yet perfect images of the sun, well defined about their edges, of a dull silvery colour, and generally 22° 30′, or 22° 35′ from his centre.

I will now state briefly two prior observations that I made here on atmospheric phenomena, but of less importance from not being so extensive. On July 30th, 1837, at a quarter past

five P.M., I noted a singular appearance of coloured parhelia and solar halos, as in fig. 2. In the course of the day there had been light showers, with lightning, thunder, and a gale from the west, which was still blowing fresh. The sun *a* shone faintly at the time, and the interior halo *b c d e* was 45° 40′ in horizontal diameter; the exterior halo *f g h*, which was incomplete in the lower part, was 91° 32′ in diameter; the curve of the inverted arch *i k* was about 23°, the width of each halo was more than a degree, and the distance of each parhelion from the sun's centre was 23° nearly. All the parhelia *l m n* were tinged with red, blue, and light yellow, but *n* was the brightest, and had not so much red in it as the others. The halos were also red next the sun, and light yellow externally. The exterior halo disappeared before six o'clock, and the interior with the lateral parhelia soon after six; but the very red inverted arch *i k*, and the parhelion *n*, did not entirely disappear till the sun had sunk to the edge of the horizon.

With regard to the prevailing clouds at the time, they were cirrus, attenuated glaring cirrostratus, and scattered broken cumuli, or remnants of scud, as a sailor would term it, beneath. There were also two currents of air prevailing, the lower one from the west, and the upper one from the north-west nearly; these, with the wild, perturbed, and hazy state of the atmosphere, to a considerable extent, were, I think, the principal agents in the production of the phenomenon.

April 20th, 1837, between 9 and 10 P.M., at the time of the lunar eclipse, I observed a lunar halo *b c d e* fig. 3. At 10h. 20m. the paraselené *f* presented itself on the eastern side of the moon *a*, another *g* on her western side at 10h. 30m., being $2\frac{1}{2}$ minutes after the end of the eclipse here, and the third *h* in the centre of a small inverted arch *i k* at 10h. 45m.; but it was most perfect at 11h. 10m.

The breadth of the colourless halo was $1\frac{1}{2}$°, its horizontal diameter 23° nearly, and the distances of the lateral paraselenæ *f g*, from the moon's centre, were respectively 23° 40′, being then two-thirds of a degree beyond the exterior edge of the halo: at intervals they were pretty well defined, circular, a little whiter than the halo, and shewed conical trains of light five or six degrees long. There was a light red tinge in *h* at the top of

the halo. The dotted line *p r q* merely represent the visible hemisphere for the altitudes of the sun and anthelia.

The atmosphere was hazy at the time above the low passing bands of cirrostratus, and the phenomenon did not disappear till nearly 12 o'clock. Paraselenæ are sometimes seen a degree or two beyond the exterior edges of lunar halos, the same as parhelia beyond the borders of large solar halos.

From the measurements of a great number of lateral paraselenæ and parhelia, I have found their angular distances from the moon's and sun's centre vary from 22° to 25°, but generally they do not exceed 23°. The deviation beyond 22½° is satisfactorily accounted for by Mariotte. I am satisfied with my measurements of these interesting phenomena, because they so nearly agree with computed angular distances, &c.

To complete this article on very rare atmospheric phenomena, I will give short descriptions of two anthelia which I observed here this year.

On January 4th, 1838, at 20 minutes past 2 P.M., my attention was drawn to the appearance of a perfect *Imago Solis*, or anthelion, as represented by *m* in fig. 3, in the cirrose crown of a nimbus just passed to the eastward: its bearing was N. 33° E., and its altitude 29°. A sextant would not measure its distance from the sun *l*, but that body being about 11° above the horizon, in the south-west quarter, its distance was, therefore, nearly 140°. To appearance it was circular as the sun, nearly of the same diameter, of a silvery colour, well defined, and sufficiently luminous to be distinguished from the white part of the cloud in which it appeared. The cloud passed slowly, and the anthelion *m* was in its western side.

The planet Venus was, at the same time, sufficiently bright to the naked eye to be measured with a sextant, with which I found her observed distance from the sun to be nearly 46½°. With a moderate power applied to an achromatic telescope, she presented nearly a similar phasis as the moon to the eastern side of her, that is, dichotomized, or only half an illuminated disc.

On January 16th, 1838, a minute before the sun's centre was on the meridian, I observed another anthelion in an almost stationary turbid nascent cumulus cloud, rising out of cirrostratus.

This compound cloud was dark and dense towards the horizon, but of a brownish colour upwards, in which a white circular spot appeared, represented by *n* in fig. 3, for at least two minutes, diametrically opposite to, and very little larger than the true sun *o*, which was then shining brightly, but surrounded with clouds. Having satisfied myself that it was an *imago solis*, I immediately took its double altitude with an artificial horizon, and found it 67° 26′ 30″ ÷ 2 = 33° 43′ 15″. The sun's altitude on the meridian at the same time was 18° 13′ 45″, which added to 33° 43′ 15″ = 51° 57′. The extent of the visible hemisphere from south to north is 180° — 51° 57′. = 128° 3′, the distance between the sun and the anthelion. Some writers have objected to the appearance of an anthelion beyond 92° from the sun, but having myself seen many of them at different altitudes, and at different seasons of the year, I am of opinion that an anthelion can appear at a distance of more than 140° from his centre, if the cloud be properly disposed to receive and reflect his image.

ON SOLAR LIGHTS AND SHADES BEHIND CLOUDS.

In the course of this and the preceding month (June and July 1838), I have observed many striking appearances of solar lights and shades about the sun, particularly in the afternoons; also faint beams of light with shades around the moon in the evening of the 5th of June. They are produced by the interposition of a dense cloud or clouds between the observer and the sun, sometimes the cumulus cloud, and the dark cirrostratus, and also the cumulo-stratus, either passing slowly, or stationary before that effulgent luminary, by which means his rays are barred in their passage, when they generally strike upwards, sometimes in all directions, making a pretty circular arrangement like the spokes of a large carriage wheel, and preserving an equal distance between each other, even when they are seen in a rotatory motion. The shades between the lights have the greater width, the lights or sunbeams are generally from half to one and a half degree wide, and from 20° to 90° in length, but are much longer in the summer months, than in the winter: they both revolve about the sun and clouds when the latter have a slow motion. This, however, is only a common appearance, when contrasted with the following

short description and figure of coloured lights and shades, viz. on July 11, 1838, at half-past 8, P.M. coloured lights and shades appeared over that point in the horizon where the sun had set. There were twelve stationary rays of rose-coloured light, semi-circularly and equidistantly arranged, with pale blue shades between, which had a pretty effect, something like a fan, as attempted to be represented in figure 4, where AB is meant for the horizon in the north-west quarter, C the sun under it, D the cloud upon which the solar rays impinged, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, the coloured solar lights, as they had mixed with the prismatic colours in the cloud before their diverging, and *a b c d e f g h i k l* the shades, which, from the clear and serene state of the atmosphere in that quarter, exhibited lemon-colour surmounted by pale blue. The coloured lights 6 and 7 immediately over the sun, extended to 35° above the horizon, and the inclined ones were from 25° to 30° in length.

The cause of this singular phenomenon in the sun's absence, was a dense sheet of cirrostratine cloud, highly tinged with prismatic colours in, under, and above the horizon, which barred the passage of the solar rays, and turned them in all possible directions, as shewn in the figure.

Gosport, Hants.

NOTICES.

IX.

NOTICE OF THE WEATHER AT PORT PATRICK, SCOTLAND. BY CAPT. SIR JOHN ROSS, C.B., R.N., F.R.S., F.R.A.S., &c. &c.

My attention has been particularly directed to the Aurora Borealis; but my observations on that phenomenon are at home, and not in a state for publication, and my engagements will not permit my return soon. I may mention the fact, that in the county of Wigton the late season has been mild there, when severe everywhere else; the ground was never completely covered with snow, and there were only two days that sufficient ice could be obtained to fill my ice-house! Having just returned from thence, I can testify that vegetation is farther advanced than near London.

Athenæum Club-House,
6th May, 1837.

X.

NOTICES OF THE GALES OF NOVEMBER 29TH, AND CHRISTMAS-DAY, 1836, AND OF 29TH NOVEMBER, 1837. BY THE REV. W. B. CLARKE, A.M. F.G.S., &c. &c.

WHILST I am writing this, I am suffering from the effects of a most *extraordinary* hurricane, which has already blown since Sunday evening, and which, having just shifted from S.W. to N.W., has blown down my trees, unroofed my houses, carried away my chimneys, and levelled the whole of my garden-walls, extending round nearly one and a half acres of ground. The sea has been tremendously high; and, what is most extraordinary, during the height of the gale, the whole surface has appeared as if *smoking*,—the effects of the wind, which has beat the spray into vapour, and carried it over fields, hedges, houses, &c., far inland, in the shape of a salt rain. The streets in Poole, whither I am now come, are strewed with tiles, bricks, &c.; and I hear several houses are unroofed in adjoining parishes. One firm here has lost a building nearly 200 yards long; roof, walls, and all, blown down, and hurled over a garden. Such a gale, and of such duration, has not been remembered for years.

Poole, Dorsetshire,
November 29th, 1836.

GALE OF CHRISTMAS-DAY, 1836.

Wind S.W. Stroud.
S. Southdown, (for a short time,) changing to N.N.E.
N.W. Hamburgh, Amsterdam, &c., changing to N.E.
E.N.E. & E. Hull, Harwich, Calais, Cherbourg.
Snow from Edinburgh to Bilboa.

GALE OF 29TH NOVEMBER, 1837.

22d, 23rd Nov. Gale commenced on the east shore of North America, off St. Lawrence.

26th, Ship "Reaper," of Poole, fell in with it, and was thrown on her beam-ends in lat. 47° N., 32° 30′ West.

29th, Gale commenced near the Land's End about $7\frac{3}{4}$ A.M., reached Plymouth $8\frac{1}{2}$ A.M.
Exeter, $9\frac{1}{2}$ A.M.
Weymouth and Poole } 10 $10\frac{1}{2}$ AM.
Farnham, 12, noon.
London, $1\frac{1}{2}$ P.M.
Suffolk coast, $2\frac{1}{2}$ P.M.
Hamburgh, 6 P.M.

N.B. This gives a regular average of about 50 miles per hour. But it must be observed, that this is the progress of the storm, and not of the wind producing it, which probably moved in its circular course between 120 and 150 miles per hour.

The ship "Jessy," of Poole, left Cork that morning at 10, with a clear mid-summer sky, and scarcely a breath of air, and had a calm passage. Two vessels reached Poole on the 30th; the one from Quebec, which had not a fine day from port to port; the other from Labrador, in 18 days, without reefing a sail, and with a fair wind and calm weather.

The fury of the gale seems to have been felt most on the coast of France and in Belgium. So great was the damage at Ostend, that tiles rose from 16 to 30 florins a thousand, there being scarcely a house not unroofed.

N.B. Shock of earthquake apparently felt at Bury St. Edmunds on 29th.
Earthquake from 1st to 22d in Croatia.
Lightning at Poole on 29th, 10 P.M.
Lightning at Petersburgh and Boston, 28th.

Poole, Dorsetshire.

XI.

NOTICE OF AN APPEARANCE OF THE AURORA BOREALIS AT WORCESTER, ON THE NIGHT OF SUNDAY, NOVEMBER 12TH, 1837.—BY EDWIN LEES, Esq., F.L.S., M.B.S., CURATOR OF THE NATURAL HISTORY SOCIETY, WORCESTER.

FEELING a considerable interest on the subject of the Aurora Borealis, which will doubtless along with other meteorological phenomena engage the attention of the Society, and, being anxious to benefit from the observations of others, I shall perhaps only be considered as acting with a becoming animus in imparting my own observations for consideration, however trifling they may appear. In scientific matters, however, it has long been obvious that even "unconsidered trifles" may, under the hand of the skilful manipulator, add considerably to the sum of our knowledge. I shall therefore briefly detail an appearance of the Aurora, at Worcester, on the evening of Sunday, November 12th.

The day had been exceedingly fine, and at sun-set the whole extent of the sky from west to south was refulgent with a glow of bright orange. As I was walking out, a few minutes after six P.M., I observed in the north-west a beam of a sanguine colour very conspicuous, which continued several minutes, and soon after a white cloudy column slowly advanced upward from the west towards the zenith. The latter gradually faded away, its anterior extremity scarcely touching, though approaching very near the zenith.

From this time till 8 o'clock, various parts of the sky appeared as if dappled with blood, or as if a reflection from some distant fire lit up the clouds. At ten minutes past 8 a bright red beam darted up from the east, passing very near the disc of the moon, and, in contrast with the light of that luminary, produced a singular effect. I now observed a body of white clouds moving high in the air with a slow motion from north to south, although the wind was westward. These clouds, as they passed across the heavens, seemed to be penetrated by a subtile current between them and the earth, which, as it serried their ranks, disarranged their line, converting the heavy masses of

cloud into squadrons of *arrow-headed cloudlets*, all pointing from east to west, and at the moment this disarrangement of the clouds took place, *a sanguine glow was suffused over them*, increasing successively for several seconds.

An electrical current appeared to be traversing the atmosphere from east to west, between the clouds before-mentioned and the earth, and at intervals along this line of march, if I may so term it, the sanguine suffusion appeared. That it did not proceed from the clouds was evident from its appearing in the air where there were no clouds behind it, but its appearance was very uncertain and transitory. Sometimes it sprung up from the horizon in beams, and at others lay upon the white clouds in sanguine or red patches, which however did not long continue so, but presented a strange and almost fearful aspect while visible. At one period the red colour tinged the clouds in the very zenith.

Above the bright red beam seen shortly after 8 P.M., a number of yellow beams shot for a short space like sky-rockets, or the puffs represented in old engravings, as issuing from the mouths of the subjects of Æolus. It was remarkable that though the moon, then but a few hours past the full, shone very bright, yet at two particular times between half-past 6 and 8, *showers of rain fell rapidly for a few minutes*, and then passed off as unexpectedly as they came on. The red hue of the beams seemed scarcely to be diminished by the light of the moon, though doubtless but for the presence of that luminary the Aurora would have assumed a much more splendid aspect than it did.

WIND, WEST.

Thermometer in the open air at 30m. past 8—49½° Fahr.
Barometer . . . . . 29·95 inches.

By the next morning, at 10 A.M., the barometer had fallen to 29·52, and on Tuesday morning was depressed to 29·40. Monday was dull and foggy, with drizzling rain, and the rain poured down throughout the whole of Tuesday. The following day the barometer recovered to 29·82, and continued gradually rising to the 17th, which was a sudden and most intense frost; barometer 29·91. The instrument was again depressed on the 19th with rain, and violent gales of wind have succeeded. I give this record of the weather rather for comparison than as meaning to assert it was necessarily connected with the aurora.

Worcester.

XII.

NOTICE OF GALES OF WIND AND A DOUBLE RAINBOW AT THE ISLE OF GUERNSEY.—BY F. C. LUKIS, Esq. M.B.S. &c.

The English papers have mentioned the brilliant appearance of the Aurora on the 18th February last, and I doubt not that many notices on this very generally seen phenomenon, will have been sent to the Meteorological Society. By the annexed will be perceived the state of the barometer on that and the preceding day. The very brilliant arch (nearly vertical), extending from east to west, was of the brightest crimson, from about 9 to 11 o'clock. The reader will best form an idea of its dimensions, and of its exact position, when I describe the situation of my dwelling-house, which lies due east and west: about 40 feet wide, from the windows of which, facing the north, the whole of the arch was visible, passing directly over the roof of the house. On going to the windows, which face the south, the whole of the arch was in like manner visible. I have been thus minute to convey more plainly the broad belt of light of the most dazzling hue, which rose from the eastern horizon towards the zenith, and thence to the western horizon, where it joined. I now have to state that on the 18th, the above-mentioned day, at about 2 o'clock of the afternoon, several persons observed what was supposed to be allied to a rainbow—an unusual pale bow—extending from east to west, nearly occupying the place which the above aurora did in the evening. I did not see it, but my daughter, who was walking about a mile from my house, was induced to hurry homewards; she described the arch as nearly vertical, pale, wide, and uniform from east to west; no iris appearing; nor rain; and its remaining so long stationary, excited her surprise and notice. She mentioned this circumstance to me when at dinner, and as she was the first to perceive the aurora at 9 o'clock in the evening, she declares the

day-light bow occupied the same space and position!—or nearly so, as shewn in the preceding diagram.

The Channel Islands, or Norman Isles, from their situation in the Bay of Avranches, and at the embouchure of the British Channel, may offer some peculiarities in the changes of climate and other meteorological phenomena from their locality alone. The sudden changes of temperature and barometric variations sets forth the effect our proximity has to a great ocean on the one hand, and the extensive mass of land which lies on the other. Certain winds are known here by local indications on the rocks, islands, and sea, and are foreseen to be approaching long before they are felt. The Islanders, like many other people of exposed coasts, prefer their own native prognostics to more laboured experiments, and as many of our countrymen are in their occupation both fishermen and farmers, their meteorological knowledge is really not despicable. It has the advantage of personal observation, united to ancient record and legendary lore, often mounting up to days of Norman glory.

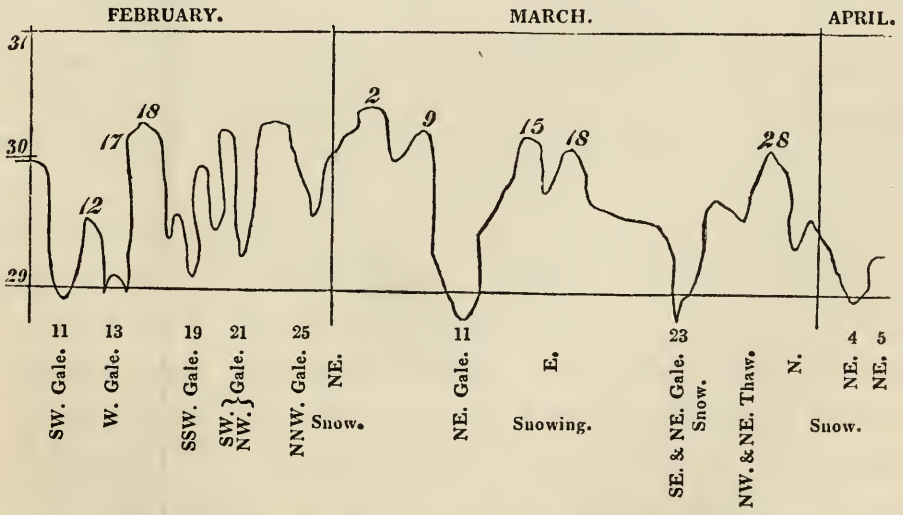
I stated above, that the natives designate the winds for instance by certain terms, and separate their general influences on the land by appropriate and significant expressions which would not be unworthy a little scientific examination,—for instance, by the way, their *vents d'amonts* embrace that cold, noisy current of air from the north to the east point, which is well known to possess a character peculiar to no other wind; their north-west, or *vent d'irlande*, as it is often termed, differs much from its neighbouring points, north, or due west; their *suagés*, or south-west has some peculiarities which have not been rightly ascertained, and require further observation. I think, as far as I have attended to these local terms, that their *suagés* does not pass beyond the point due south. By their *sudest* or *sués*, which reaches nearly to the east, a very different current is expressed; it is from this quarter that our thunder storms usually arise, as well as our greatest falls of snow; we also receive gusts of wind, and sometimes violent gales from this quarter, which, though of short duration, are connected with other winds, particularly the west, from which point a south-east gale invariably terminates;—may not the promontory of Britanny, lying between the Bay of Biscay and the mouth of the British Channel, effect this, or exert some influence on the character of this current? It would be useful to pursue these

remarks further. Comparing the last seven years with the first seven years of this century, I find on each year a great increase of easterly winds, to which I attribute the last three years of drought. South-west winds were usually prevalent here, in the proportion of 3 to 1; but this wind has not exceeded during the above period—the north-east having prevailed. The wind from the point due north, is rather of rare occurrence, perhaps somewhat modified by crossing the *tidal* British Channel at a right angle?

The commonly assigned cause of the increased temperature of the south-west, as derived from the Atlantic Ocean, appears to me vague and unsatisfactory; the effect of the sea on those local and periodical winds, called Land and Sea Breezes, may indeed belong to the influencing causes of the sea and land; but the more extended masses, which traverse the new and old continents, are doubtless under another influence. I hope this subject, which appears to be now under consideration, will receive further éclaircissement through the exertions of the Society.

There are accounts from France, and the North of Spain, which give nearly the same as the above changeable and truly winter-like Spring.

FLUCTUATIONS OF THE BAROMETER AND THE PREVAILING WINDS.*



* The above diagram is intended rather to show the manner than the amount of the barometer's oscillation.

Guernsey, April 5, 1837.

XIII.

GENERAL OBSERVATIONS MADE ON THE WEATHER AT HIGH WYCOMBE, BUCKS., LAT. 51° 37′ 44″ NORTH; LONG. 34′ 45″ WEST, DURING THE YEAR 1837. BY JAMES G. TATEM, Esq.

JANUARY.— During the last thirteen years the thermometer has never before reached to 58 degrees, and only twice in that time, viz. in 1828 and 1834, has the mean temperature been so high, and only in those years has there been so much rain and melted snow. This proves that humidity and warmth attend each other even at this season of the year. The range of the barometer was small, and the mean was very nearly the same as in the corresponding month of last year; the extreme of cold happened on the night of the 1st, as it did on the night of the 1st of January last year. Snow fell on five different days, but the whole quantity was very little; but once covering the ground to the depth of a quarter of an inch, which soon melted away. At 10 P.M. on the 23rd, the thermometer, which stood at 51° at 3 P.M., had risen to 58°, when the whole atmosphere had the appearance of steam; the minimum of the night was 47°.

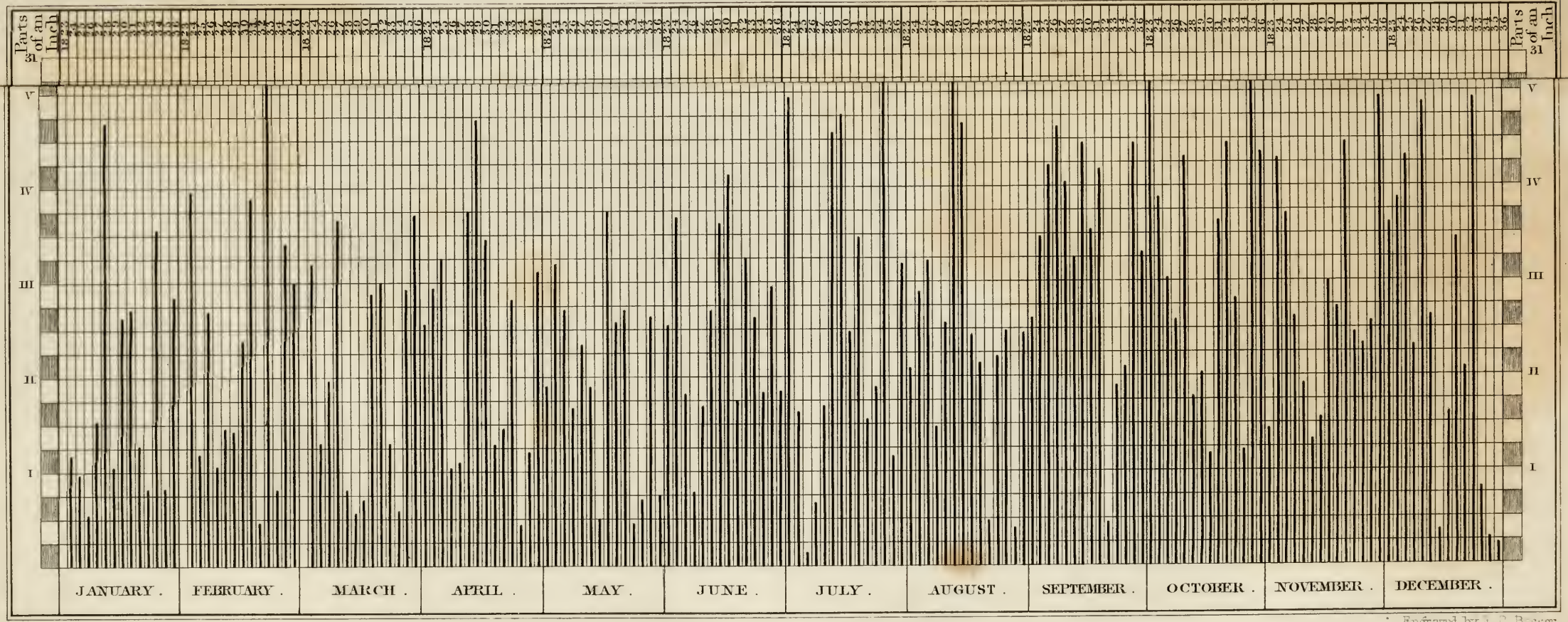
FEBRUARY.—This was the warmest February that has occurred during the last thirteen years, although the maximum was not so high as in the corresponding months in 1828 and 1831; but the range was nearly thirty degrees. The mean of the barometer was higher than usual for the month, although the maximum was lower than the average. Snow fell on the night of the 26th and morning of the 27th, but did not lie long on the ground, which was only partially covered. The quantity of rain and melted snow has been exceeded only four times in the same month in the period before mentioned. On the night of the 18th, about half-past ten o'clock, the heavens were illuminated by a brilliant arch, of about ten degrees in breadth, of a deep red or vermillion colour, formed by two streams of light;

DIAGRAM,

SHEWING THE RANGE OF THE BAROMETER FOR EACH MONTH,

From the Commencement of April 1823, to the end of the Year, 1836.

FROM OBSERVATIONS MADE AT HIGH WYCOMBE, IN THE COUNTY OF BUCKS, IN LAT: 51° 37′ 44″ N° LON: 34′ 45″ W^t BY J. G. TATEM.



Engraved by J. T. Bearer.

London, Published by Smith, Elder & C° 65, Cornhill.

DIAGRAM,

SHEWING THE RANGE OF THE BAROMETER FOR EACH MONTH.

From the Commencement of April 1823, to the end of the Year 1836.

FROM OBSERVATIONS MADE AT HIGH WYCOMBE, IN THE COUNTY OF BUCKS, IN LAT. 51° 37′ 14″ N° LON. 34′ 45″ W° BY J. G. TATEM

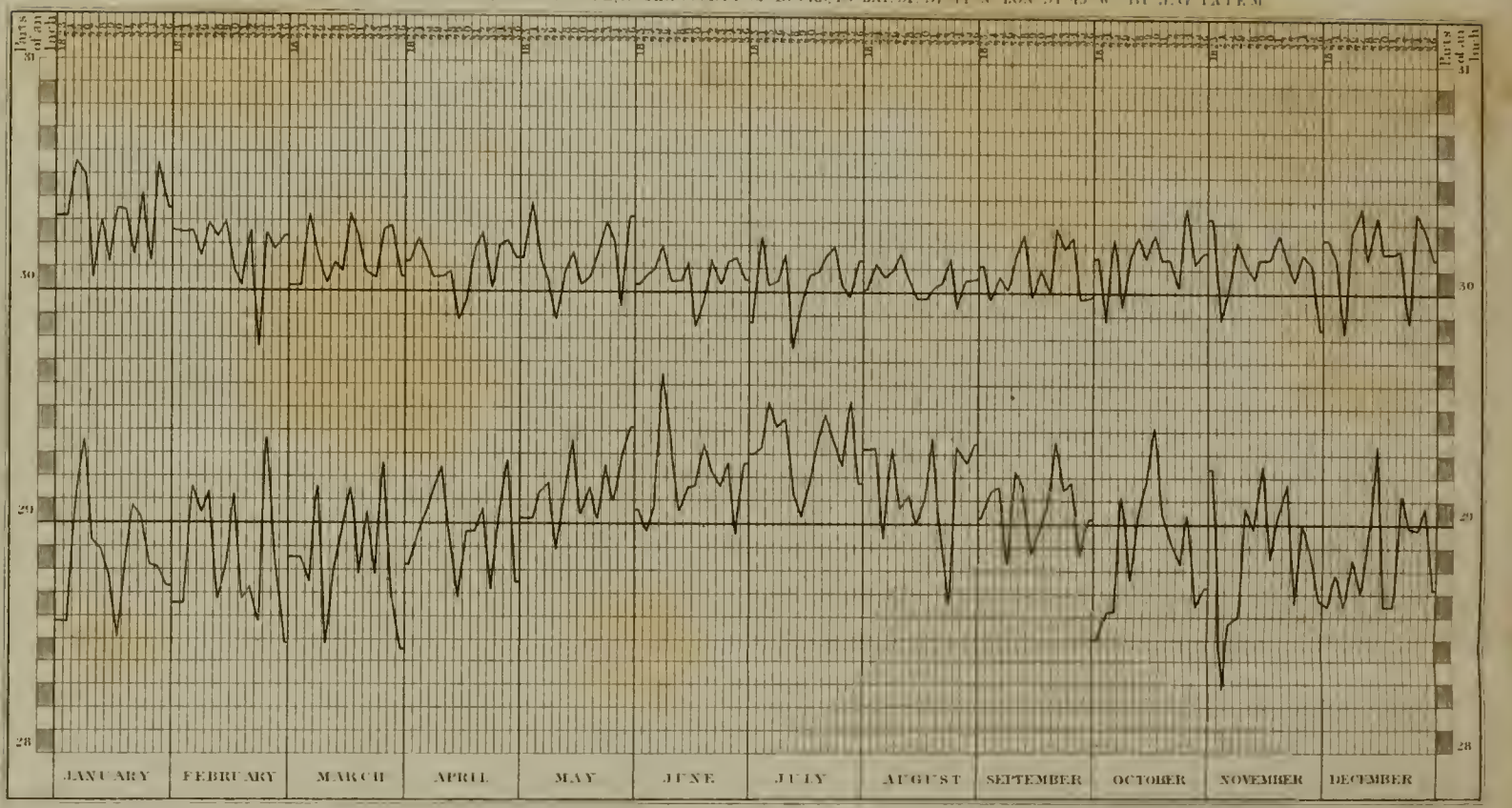
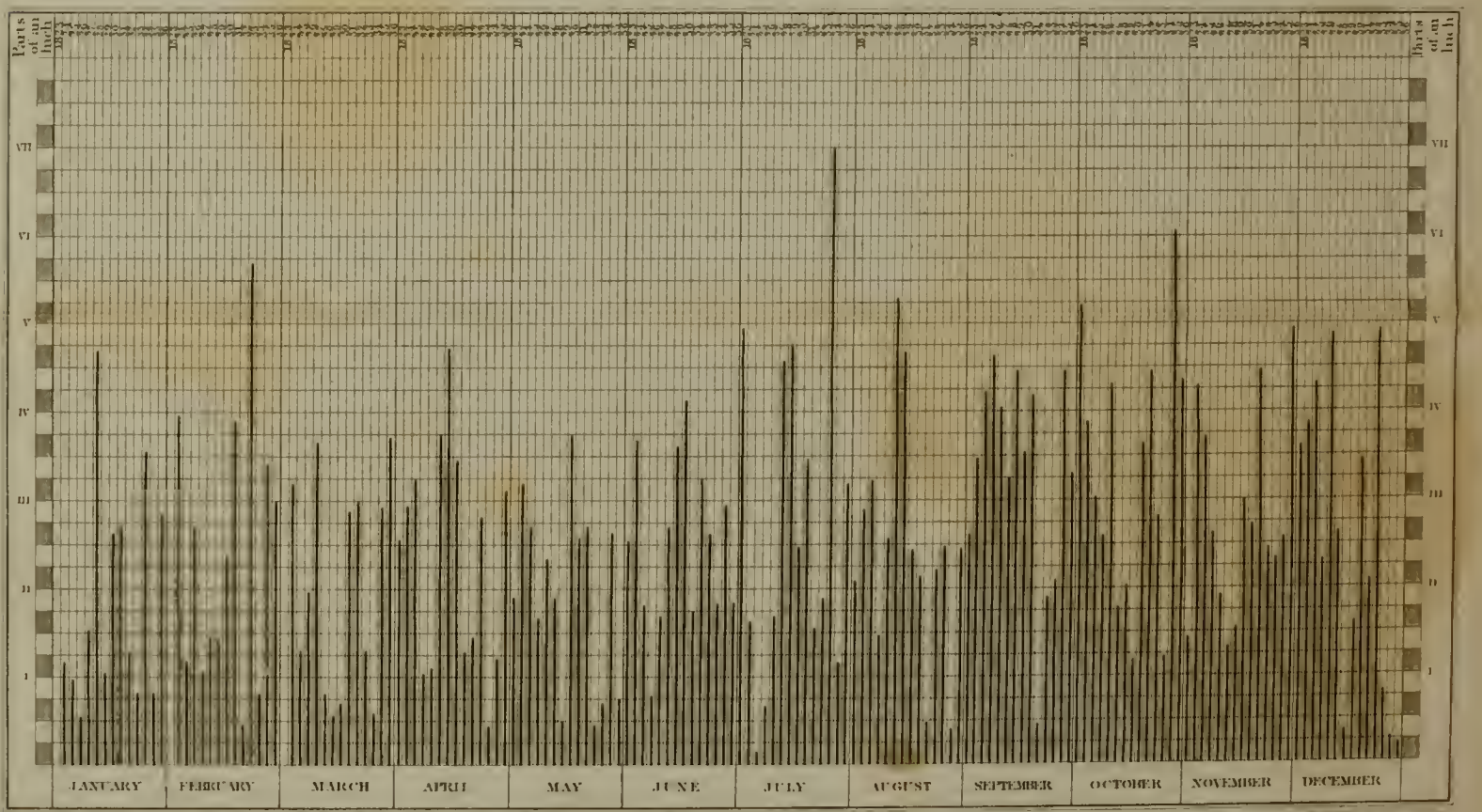


DIAGRAM SHEWING THE QUANTITY OF RAIN FOR THE SAME PERIOD



the one arising in the north-east, passing over Arcturus and Ursa Major; and the other originating in the south-west, leaving Orion to the southward, passing over Aldebaran and Capella, and meeting in the Zenith where the light was very faint. The western limb was the brightest, and at intervals shot forth rays of light approaching to a flame colour. The edges of the main stream were *then* fringed, and had a feathery appearance; the eastern leg of the arch was the first that began to fade, spreading wider, and becoming fainter when that part of the sky was mottled, like that called mackarel sky, but still retaining its red tint; the stars were seen through the Aurora, which had nearly disappeared by eleven o'clock, the moon all the time shining brightly, and nearly on the meridian, the planet Mars almost touching her south-eastern limb, and Jupiter being but a short distance from her to the westward. The barometer stood at 29·37, and the temperature was forty degrees, a light breeze blowing from the westward.

March.—Unlike the last month, which was warm for the season, this was the coldest March that has occurred during the last thirteen years,—the maximum never rising so high as temperate, by four degrees and a half; the minimum was fourteen degrees below the freezing point, and the mean of the month was but little more than three degrees above it. The barometer was generally high, and the mean has been exceeded only four times in the period above referred to. The quantity of rain and melted snow was less than usual for the month. Snow fell on eight different days, viz., the 12th, 20th, 21st, 22nd, 23rd, 25th, 26th, and 27th. That which lay on the ground, and could be measured, was eight inches in depth; and this fell on the 20th, 21st, and 22nd. The wind blew from the northward on eighteen days, and the whole month may be considered as having been dry, bleak, and cold.

April.—The same prevalence of cold was experienced during this, as in last month, and the mean temperature was nearly *three* degrees lower than in any April in the last fourteen years; yet the maximum was five degrees higher than in the same month last year. The barometer was generally steady, the range being small, and the mean but little above that of last

year. The quantity of rain and melted snow was much less than that in the corresponding month last year, though more than in the two years preceding 1836. Snow, sleet, and hail fell several times during the month; but the snow never lay upon the ground. An indistinct lunar halo was seen about 9 P.M. on the 14th, and thunder was heard on the 30th about 5 P.M. The commencement of the eclipse on the night of the 21st was not seen advantageously at Wycombe; a thick bank of cloud obscured the horizon, and the moon had risen several degrees before she became visible, and even then she was partly covered by clouds. At the period of the total darkness commencing, large cumuli were formed, and the moon was again hidden until nearly nine o'clock, when the whole disc was seen entirely veiled by the earth's shadow, having a dusky rufous appearance. At nearly half-past nine, the first portion of the moon, cleared from the obscuration, was perceived, when the appearance was extremely beautiful, the brilliancy of the bright limb of the moon being highly contrasted with that under eclipse. After the eclipse was over, the moon shone with considerable lustre; at least she appeared to do so, from the impression made on the mind by her recent darkness.

MAY.—Another month of cold weather was experienced, the mean temperature being lower than any in the same month during the last fourteen years. On five nights the thermometer was below the freezing point. The barometer was lower than usual, though not so low as in May 1835. Hail, rain, and snow, fell on the 10th; the quantity of rain was more than in the corresponding month last year, but less than the average. Thunder was heard in the distance on the 14th.

JUNE.—The month was warmer than in 1836, although the maximum was not so high as in the three last years, and the minimum was three degrees lower than in June last year. The quantity of rain was less than in any corresponding month since 1826. The barometer was higher than the average of the month, and the mean has been exceeded only twice, in the same month, in the last fourteen years; from the 19th to the end of the month was particularly fine, and no rain fell. Thunder was heard about 4 P.M. on the 25th.

July.—The month was very fine, the quantity of rain being small, little more than one-half of the quantity in July last year, and twenty-one days were without rain. The mean temperature was higher than in the same month last year, but not so high as in the two preceding years. The barometer was lower, as respects the extremes, than in the corresponding month last year; but there was an extraordinary coincidence in the mean and that of last year, the difference being only the ·0029th part of an inch. Thunder was heard on the 18th in the afternoon; the wind chiefly from the westward, veering from the south-west to the north-west.

August.—A greater quantity of rain fell during the month than in any August in the preceding seven years, and it all fell in eleven days; the quantities on the 26th and 29th were unusually great. The mean of the barometer was lower than in the same months in 1835 and 1836; but the maximum was higher than any in the last four years, and the range was small. The thermometer was higher than last year, as to the maximum and mean, although it did not reach the elevation of the corresponding months in 1834 and 1835. Lightning was seen on the 19th, and thunder heard on the 30th. On the 26th there was a heavy storm of thunder and lightning, from 11 A.M. until noon; one flash at half-past eleven was extremely vivid, and was followed by a tremendous clap of thunder; after which the storm abated.

September.—The temperature of the month was lower than since September 1833, as respects the mean and maximum, although the minimum in 1834 was half a degree lower. The barometer was higher than in 1835 and in 1836; and only once in the last fourteen years, has so little rain fallen in September, viz., in 1832; from the 18th to the end of the month, no rain fell, and the weather was very fine.

October.—The maximum of the barometer was above any one in October, during the journalist's residence at Wycombe (fourteen years), and only twice has the mean been exceeded during that period; the last time in October 1830, the quantity of rain was small, being very much less than the average. From

the 5th to the 22nd no rain fell. The mean temperature was below the average, although the maximum was higher than usual, the range was upwards of forty degrees.

The night of the 13th, on which the lunar eclipse occurred, was remarkably clear, and the commencement and progress of the eclipse were seen very favourably; during the total obscuration, the body of the moon was of a dusky red colour, but when she began to emerge from the earth's shadow, and her bright limb was first seen, the appearance was very interesting; the colours of the remaining portion of her disc were from bright orange, to red, purple, and dark blue, but these changed rapidly as the eclipse passed off; the thermometer, during the eclipse, fell from 41° 50, to 35° 25, — or 6° 25! the barometer standing very steadily at 30·38.

November. — The month was colder than any November during the last fourteen years; the barometer was higher than the average of the month, although the maximum has been exceeded frequently, and the quantity of rain was more than has fallen, in the corresponding month, since 1833. A most brilliant rainbow was seen on the 1st, at a quarter past 3 P.M. The aurora, on the evening of the 12th, was not of long continuance here; at 6 P.M. some red rays shot up from the N.W., and a slight tinge of red was observed in that direction, which at intervals became more brilliant, the moon shining brightly in the N.E.; but clouds soon collected, obscured the moon, and the aurora shortly afterwards disappeared.

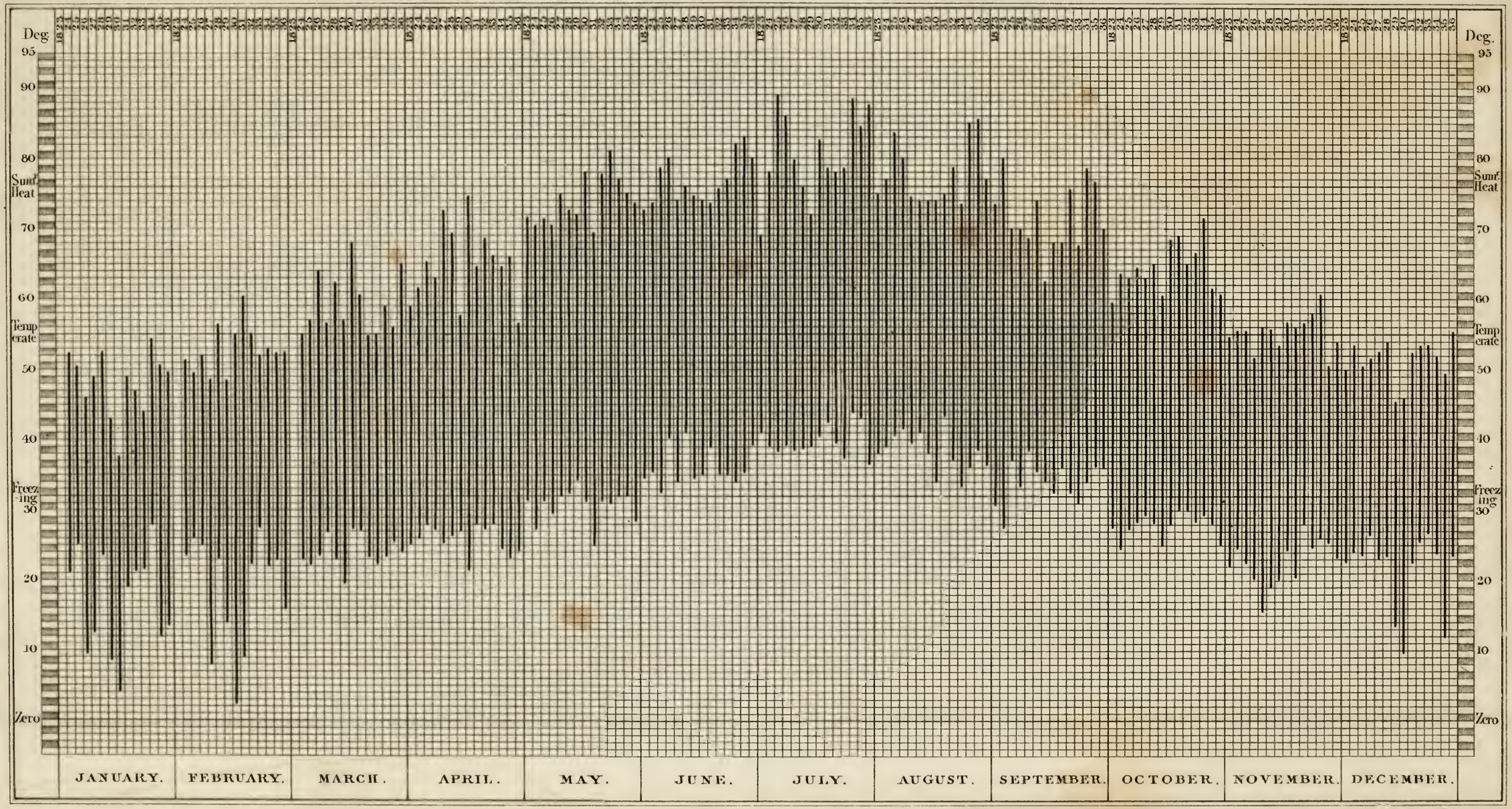
December. — The mean temperature was above those, in the same month, since 1833; but the maximum was 4 degrees lower than in December last year. The range of the barometer was small, and the mean above the average of the month, but much lower than in the corresponding months in 1834 and in 1835. Snow fell on the 6th, and about two inches lay upon the ground on the morning of the 7th, but which soon melted. The quantity of rain and melted snow was much more than in the same months of the last three years. On the 18th, 19th, and 20th, it blew hard; and on the 19th, half an inch of rain fell.

DIAGRAM,

SHEWING THE RANGE OF THE THERMOMETER FOR EACH MONTH,

From the Commencement of April 1823, to the end of the Year 1836.

FROM OBSERVATIONS MADE AT HIGH WYCOMBE, IN THE COUNTY OF BUCKS, IN LAT: 51°. 37'. 44". N° LON: 34'. 45". W^T BY J.G. TATEM.



Engraved by F. P. Becker

London Published by Smith, Elder & Cº 65, Cornhill.

METEOROLOGICAL SUMMARY AT HIGH WYCOMBE, BUCKS.

Shewing the Maximum, Minimum, and Mean of the Thermometer and Barometer; the Depth of Rain; the passing Phenomena, and Winds for the Year 1837.

1837.	THERMOMETER.			BAROMETER.			RAIN.	No.of Rainy Days.	No. of Snowy Days.	No.of Fair Days.	WINDS.							
Month.	Highest.	Lowest.	Mean.	Highest.	Lowest.	Mean.	In. Dec.				NE.	E.	SE.	S.	SW.	W.	NW.	W.
January	58°	14°·50	38°·127	30.25	29·00	29·659	3·281	17	5	9	5	...	7	4	5	2	7	1
February	55 ·25	25 ·50	40 ·955	30·09	28·85	29·675	3·056	16	1	11	...	5	5	1	7	4	5	1
March	50 ·50	17 ·75	35 ·286	30·15	29·01	29·692	1·093	5	8	18	2	1	1	1	2	7	1	16
April	61 ·50	23	38 ·379	30·09	29·08	29·531	1·718	8	3	19	2	...	3	...	5	5	9	6
May	70 ·75	29	46 ·187	30·10	29·34	29·694	0·806	10	1	20	1	1	...	5	2	6	9	7
June	79	36 ·50	56 ·004	30·08	29·29	29·753	1·487	10	...	20	...	6	...	5	5	7	3	4
July	80	39	58 ·431	30·06	29·11	29·742	1·64	10	...	21	2	1	...	3	9	3	10	3
August	82	37 ·50	57 ·201	30·13	29·14	29·728	3·15	11	...	20	4	3	3	4	6	4	3	4
September	69 ·25	34 ·50	52 ·454	30·08	28·83	29·633	1·618	11	...	19	4	6	3	4	3	4	3	3
October	67 ·75	27	46 ·737	30·41	28·98	29·847	1·89	13	...	18	2	2	1	8	3	11	3	1
November	52 ·75	21 ·50	37 ·131	30·16	28·56	29·676	2·00	16	...	14	1	...	2	5	3	9	8	2
December	51 ·25	23	38 ·618	30·20	29·02	29·677	1·962	11	1	19	2	5	7	3	6	4	3	1
YEAR.	82	14·50	45 ·459	30·41	28·56	29·692	23·070	138	19	208	25	30	32	43	56	66	64	49

XIV.

METEOROLOGICAL SUMMARY AT CHELTENHAM.

BY SAMUEL MOSS, ESQ., M.C.P.I. &c.

1837.

1837.	THERMOMETER.				BAROMETER.				RAIN.	WINDS.							
	Max.	Min.	Mean.	Range	Max. In. Dec.	Min. In. Dec.	Mean. In. Dec.	Range. In. Dec.	Inches.	E.	W.	N.	S.	NE.	NW.	SE.	SW.
January.....	53°·0	25°·0	37°·524	28°·0	30·27	29·05	29·696	1·22	2·83	$3\frac{1}{2}$	3	$6\frac{1}{2}$	$3\frac{1}{2}$	4	$3\frac{1}{2}$	2	5 Days
February	54 ·5	28 ·0	41 ·875	26 ·5	30·10	28·82	29·684	1·28	3·59	..	2	..	5	..$\frac{1}{2}$	$4\frac{1}{2}$	$7\frac{1}{2}$	$8\frac{1}{2}$,,
March	47 ·0	20 ·0	36 ·508	27 ·0	30·15	29·02	29·73	1·13	1·08	5	..$\frac{1}{2}$	$4\frac{1}{2}$	..	$8\frac{1}{2}$	3	$2\frac{1}{2}$	7 ,,
April	58 ·0	26 ·0	41 ·116	32 ·0	30·15	29·12	29·564	1·03	1·53	$1\frac{1}{2}$	1	4	2	6	$5\frac{1}{2}$	..$\frac{1}{2}$	$9\frac{1}{2}$,,
May	69 ·0	35 ·5	51 ·073	33 ·5	30·14	29·35	29·71	0·79	0·875	..$\frac{1}{2}$	..$\frac{1}{2}$	9	2	4	$2\frac{1}{2}$	2	$10\frac{1}{2}$,,
June.....	76 ·0	42 0	59 ·991	34 ·0	30·06	29·26	29·744	0.8	1·05	5	1	..$\frac{1}{2}$	$3\frac{1}{2}$	$2\frac{1}{2}$	2	$3\frac{1}{2}$	12 ,,
July	77 ·0	48 ·0	63 ·2	29 ·0	30·08	28·87	29·71	1·21	2·9	6	8	$2\frac{1}{2}$	2	$2\frac{1}{2}$	$3\frac{1}{2}$	..	$7\frac{1}{2}$,,
August.....	75 ·0	45 ·0	60 ·6	30 ·0	30·12	29·21	29·73	0·91	5·58	$3\frac{1}{2}$	$1\frac{1}{2}$	..	$6\frac{1}{2}$	$4\frac{1}{2}$	3	$3\frac{1}{2}$	$8\frac{1}{2}$,,
September....	69 ·0	43 ·5	55 ·43	25 ·5	30·05	28·86	29·62	1·19	2·29	$3\frac{1}{2}$	2	$1\frac{1}{2}$	4	$5\frac{1}{2}$	1	5	$7\frac{1}{2}$,,
October.....	68 ·5	36 ·5	51 ·3	32 ·0	30·38	28·96	29·84	1·42	1·83	..	5	2	1	3	$1\frac{1}{2}$	$1\frac{1}{2}$	17 ,,
November....	54 ·5	29 ·0	42 ·723	25 ·5	30·12	28·63	29·562	1·49	1·935	..	$3\frac{1}{2}$	2	3	..	$4\frac{1}{2}$	$4\frac{1}{2}$	$12\frac{1}{2}$,,
December.....	55 ·0	31 ·5	41 ·992	23 ·5	30·25	29·00	29·686	1·25	2·38	4	..$\frac{1}{2}$	1	4	$4\frac{1}{2}$	..$\frac{1}{2}$	$8\frac{1}{2}$	8 ,,
FOR THE YEAR.	77 ·0	20 ·0	48 ·611	57 ·0	30·38	28·63	29·681	1·75	27·87	$32\frac{1}{2}$	$28\frac{1}{2}$	$33\frac{1}{2}$	$36\frac{1}{2}$	$45\frac{1}{2}$	34	41	$113\frac{1}{2}$

THERMOMETER, 1837.

Highest—77°. July 26th. || Lowest—20°. March. 24th.

RAIN, 1837.

27·87 inches.

BAROMETER, 1837.

Highest—30·38. Oct. 14. || Lowest—28·63. Nov. 1.

The temperature is ascertained by a horizontal self-registering thermometer, suspended in the open air, about five feet from the ground, in a north-east aspect, and the observation made at 8 o'clock A.M.—The pressure of the atmosphere, and the direction of the winds, are registered at 8 o'clock A.M. and 8 o'clock P.M.—The quantity of rain which has fallen is taken by Crossley's rain gauge, and is registered at 8 o'clock A.M.

XV.

METEOROLOGICAL SUMMARY AT ST. JOHN'S, NEWFOUNDLAND. BY JOSEPH TEMPLEMAN, Esq., COLONIAL SECRETARY'S OFFICE, NEWFOUNDLAND. LAT. 47° 34′ 3″ N., LONG. 52° 38′ 30″ W.

From the following table it will be observed that in the peculiar climate of this island the mean temperature of the month of September is very little below that of July, whilst that of October is nearly equal to that of June. The first fortnight in February is usually the severest part of the winter—in which period the thermometer in some seasons sinks to from 10° to 20° below the zero of Fahrenheit. The temperature shewn is the mean of the maximum and minimum of every 24 hours, commencing at 9 A.M. It generally happens that the greatest degree of cold occurs on the morning following the date here shewn. Where two dates are mentioned, it shews, of course, that the same extreme occurred on both days.

As regards the barometer, it may be observed that it is scarcely ever steady for 6 hours together. In winter its oscillations are very great and sudden, sometimes as much as from $1\frac{1}{2}$ to $2\frac{1}{2}$ inches, in the course of 36 hours. These take place in the winter months—during which is experienced in the course of every four days almost every variety of weather. The barometer attains, during that interval, to the height of from 30·20 to 30·40, the weather is always calm and serene and the cold severe—the barometer soon indicates a change—a breeze springs up from the S.E., and increases to a gale, with snow and drift. This is sometimes succeeded by heavy rain from S.W. (the temperature, which in the morning was perhaps near or below zero, rising to above 40), and in a few hours the wind, which had in a great degree subsided during the rain, suddenly shifts to the N.W., when the barometer (which on these occasions falls rapidly and almost always sinks to several 10ths below 29 inches) begins to rise again, which it does as rapidly as it had before fallen. At the turn of the barometer the gale appears to increase for an hour or two, and then gradually subsides.

N.B.—In these tables it will be seen that in the year 1836, there was only one month (August) in which the thermometer did not fall below "freezing."

THERMOMETER.			JAN.	FEB.	MARCH	APRIL	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
1834.	Mean of the Month		$17\frac{17}{62}$	$16\frac{5}{8}$	$20\frac{50}{62}$	$30\frac{1}{2}$	$39\frac{25}{62}$	$49\frac{17}{30}$	$58\frac{9}{62}$	$58\frac{29}{62}$	$56\frac{1}{12}$	$47\frac{25}{31}$	$33\frac{17}{30}$	$25\frac{13}{62}$
	Extremes	Highest	36	40	46	46	57	76	86	78	74	70	52	45
		Lowest	—7	—14	—6	13	24	30	37	36	36	28	15	4
	Mean of Extremes		$14\frac{1}{2}$	13	20	$29\frac{1}{2}$	$40\frac{1}{2}$	48	$61\frac{1}{2}$	57	55	49	$33\frac{1}{2}$	$24\frac{1}{2}$
	Days on which Extremes occurred.	Highest	18th	11 & 16	22d	25th	10th	8th	15th	25th	3d&4th	10th	15th	15th
		Lowest.	31st	6th	3d	17th	30th	18th	1st	10th	16th	26th	29th	29th
1835.	Mean of the Month		$24\frac{13}{31}$	$25\frac{1}{2}$	$22\frac{41}{62}$	$33\frac{42}{60}$	$39\frac{10}{31}$	$48\frac{29}{31}$	$58\frac{33}{62}$	61	$55\frac{5}{6}$	$46\frac{10}{31}$	$31\frac{53}{60}$	$24\frac{27}{62}$
	Extremes	Highest	44	47	47	51	60	73	80	81	77	70	54	46
		Lowest	—5	0	—2	19	25	29	37	43	35	25	14	8
	Mean of Extremes		$19\frac{1}{2}$	$23\frac{1}{2}$	$22\frac{1}{2}$	35	$42\frac{1}{2}$	51	$58\frac{1}{2}$	62	56	$47\frac{1}{2}$	34	27
	Days on which Extremes occurred.	Highest	1st	28th	23d	7 & 8	30th	21 & 28	19th	11th	1st	9th	17th	27th
		Lowest.	4th	3d	12th	5th	23d	10th	12th	7th	16th	27th	22 & 25	24th
1836.	Mean of the Month		$26\frac{1}{31}$	$24\frac{33}{58}$	$23\frac{41}{62}$	$31\frac{26}{31}$	37	$45\frac{1}{60}$	$55\frac{5}{6}$	$57\frac{25}{62}$	$49\frac{11}{30}$	$43\frac{57}{62}$	$36\frac{4}{15}$	$27\frac{28}{31}$
	Extremes	Highest	48	48	55	60	66	80	81	78	74	71	61	47
		Lowest	4	1	2	14	18	27	30	40	30	22	20	2
	Mean of Extremes		26	$24\frac{1}{2}$	$28\frac{1}{2}$	37	42	$53\frac{1}{2}$	$55\frac{1}{2}$	59	52	$46\frac{1}{2}$	$40\frac{1}{2}$	$24\frac{1}{2}$
	Days on which Extremes occurred.	Highest	25th	22d	11th	22d	19th	7th	12 & 14	2d	5th	6th	16th	31st
		Lowest.	17th	27 & 28	19th	12th	3d	3d	2d	29th	24th	31st	19th	23 & 24
1837.	Mean of the Month		$26\frac{21}{31}$	$20\frac{3}{14}$	$27\frac{27}{31}$	$37\frac{1}{3}$	$39\frac{11}{31}$	$45\frac{5}{12}$						
	Extremes	Highest	46	40	45	60	60	73						
		Lowest	0	—6	2	25	25	29						
	Mean of Extremes		23	17	$23\frac{1}{2}$	$42\frac{1}{2}$	$42\frac{1}{2}$	51						
	Days on which Extremes occurred.	Highest	23d	28th	11th	29th	23d	22 & 25						
		Lowest.	28th	7th	5th	23d	2d	3 & 20						

TABLE shewing the Mean Temperature in each Month in the $3\frac{1}{2}$ Years, ending 30th June, 1837—with the Extremes, and the Days on which such Extremes occurred.

BAROMETER.			Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1834.	Mean of the Month		29·63	29·75	29·73	29·60	29·85	29·87	29·84	29·86	29·86	29·95	29·68	29·79
	Extremes	Highest	30·30	30·35	30·30	30·42	30·40	30·27	30·28	30·25	30·32	30·30	30·13	30·67
		Lowest	28·60	28·50	28·80	28·80	29·35	29·35	29·48	29·40	29·50	29·40	29·11	28·98
	Mean of Extremes		29·45	29·425	29·55	29·61	29·87	29·81	29·88	29·82	29·91	29·85	29·62	29·82
	Days on which Extremes occurred.	Highest	30th	10 & 18	8 & 28	5th	16th	6th	20th	31st	14th	12 & 19	17th	19th
		Lowest.	22d	27th	14th	29th	1st	15th	1st	8 & 14	7 & 10	10th	8th	7th
1835.	Mean of the Month		29·67	29·81	29·75	29·61	29·64	29·83	29·80	29·87	29·90	29·98	29·58	29·52
	Extremes	Highest	30·20	30·44	30·49	30·17	30·30	30·11	30·20	30·25	30·27	30·45	30·15	30·15
		Lowest	28·75	28·78	28·62	28·95	29·09	29·35	29·37	29·57	29·15	29·38	28·97	28·50
	Mean of Extremes		29·47	29·61	29·55	29·56	29·70	29·73	29·78	29·91	29·71	29·91	29·56	29·32
	Days on which Extremes occurred.	Highest	6th	15th	8th	5th	13th	28th	21st	16th	13th	20th	15th	20th
		Lowest.	1st	5th	18th	15th	3d	5th	17th	17th	3d	12th	21st	3d
1836.	Mean of the Month		29·81	29·78	29·77	29·81	29·76	29·85	29·83	29·88	29·80	29·80	29·62	29·80
	Extremes	Highest	30·42	30·52	30·30	30·37	30·10	30·22	30·11	30·14	30·33	30·30	30·23	30·55
		Lowest	29·04	28·78	28·90	29·20	29·30	29·20	29·35	29·43	29·31	29·30	28·24	29·05
	Mean of Extremes		29·73	29·65	29·60	29·78	29·70	29·71	29·73	29·78	29·82	29·80	29·23	29·80
	Days on which Extremes occurred.	Highest	24th	20th	10th	21st	27th	6th	12th	6 & 12	7th	2d	9th	25th
		Lowest.	26th	15th	2d	2d	5 & 8	16th	20th	9th	20th	28th	30th	1st
1837.	Mean of the Month		29·29	29·46	29·89	29·50	29·64	29·67						
	Extremes	Highest	29·95	30·04	30·44	30·05	30·22	30·02						
		Lowest	28·76	28·67	29·15	28·80	28·95	29·34						
	Mean of Extremes		29·30	29·35	29·80	29·42	29·58	29·68						
	Days on which Extremes occurred.	Highest	30th	27th	5th	24th	20th	1st						
		Lowest.	8th	13th	27th	6th	2d	12 & 30						

Table shewing the Mean Height of the Barometer in each Month in the 3½ Years, ending 30th June, 1837—with the Extremes, and the Days on which such Extremes occurred.—Barometer above level of the Sea, 140 feet.

XVII.

METEOROLOGICAL SUMMARY AT SWANSEA

	January.	February.	March.	April.	May.
THERMOMETER (SIX'S.)					
9 A.M. Max. of ther.	61	63	69	65	64
9 A.M. Min. of ther.	24	32	27	30	39
9 A.M. Mean max. of ther.	48	53	54	54	38
9 A.M. Mean min. of ther.	37	42	35	38	47
9 A.M. Mean of the whole	42	47	44	46	53
5 P.M. Max. of ther.	61	65	69	71	67
5 P.M. Min. of ther.	32	41	31	37	39
5 P.M. Mean max. of ther.	47	54	53	58	59
5 P.M. Mean min. of ther.	40	46	42	47	52
5 P.M. Mean of the whole	43	50	47	52	56
Gt. range of ther. in 24 h.	26	28	37	38	27
Lt. range of ther. in 24 h.	1	8	6	6	8
Range for the month	32	33	42	41	28
Average daily range	13	15	21	23	14
Mean temp. for the month	42½	48	46	49	54
BAROMETER.					
9 A.M. Max. of barometer	30·45	30·19	30·28	30·83	30·29
9 A.M. Min. of barometer	29·08	28·84	29·12	29·27	29·08
9 A.M. Mean height	29·79	29·73	29·84	29·71	29·85
5 P.M. Max. of barometer	30·42	30·13	30·27	30·29	30·27
5 P.M. Min. of barometer	29·05	28·28	29·14	29·22	26·06
5 P.M. Mean height	29·76	29·20	29·85	29·70	29·85
Gt. range of bar. in 24 h.	1·06	1·10	0·45	0·69	0·67
Least range in 24 hours	0·02	0·02	0·01	0·03	0·01
Range for the month	1·40	1·91	1·15	1·61	1·23
Average daily range	0·25	0·36	0·17	0·20	0·16
Mean height for the month	29·77	29·46	29·82½	29·70	29·85
HYGROMETER (DANIELL'S.)					
9 A.M. Maximum dew point	48	50	44	52	55
9 A.M. Minimum dew point	28	32	24	27	31
9 A.M. Mean dew point	39	43	35	39	47
5 P.M. Maximum dew point	47	49	45	54	66
5 P.M. Minimum dew point	29	33	28	26	30
5 P.M. Mean dew point	39	43	36	39	47
Mean for the month	39	43	35	39	47
Mean in gr. per cubic foot	2·284	3·308	2·497	2·839	3·876
PLUVIOMETER (CROSSLEY'S)					
Rain fallen	2·89	3·35	0·91	1·62	1·29
Gt. quan. in the 24 hours	0·51	0·56	0·20	0·54	0·47
Prevailing wind	ESE	ESE & SSW	SE & E	NNE	E & NE
Prevailing clouds	Nimbus	N. & C. C.	C.C. & N.	N. & C.C.	C.C. & N.
Days with rain	16	17	11	8	7
Days with snow or hail	—	3	6	3	—
Days with thunder	—	1	—	—	3
Cloudy days	—	—			
Fine days	14	11	20	22	24
Days with fog or mist	5	6	9	5	6

XVII.

FOR 1837. BY J. W. G. GUTCH, Esq., M.R.C.S., &c.

June.	July.	August.	Sept.	Oct.	November.	Dec.	For the year 1837.
75	81	79	71	65	56	56	79
47	54	46	46	41	33	31	24
65	70	67	62	59	52	48	—
55	60	59	53	51	43	42	—
60	65	63	57	55	47	45	—
79	81	80	76	68	58	60	81
50	57	55	52	45	36	31	31
67	72	70	64	60	52	49	—
59	65	63	58	54	46	45	—
63	68	66	60	57	49	47	—
20	20	23	16	20	23	24	38
6	4	4	1	3	3	13	1
32	27	34	30	27	25	29	—
12	12	12	11	10	11	21	—
62	64	65	59	61	48	46	53·8
30·08	30·18	30·22	30·19	30·60	30·23	30·30	30·83
29·41	29·19	29·41	29·34	29·27	29·16	29·16	28·84
29·87	29·90	29·86	29·80	30·00	29·74	30	
30·18	30·18	30·19	30·23	30·59	30·22	30·33	30·59
29·36	29·01	29·28	29·09	29·19	29·01	29·32	28·28
29·88	29·87	29·86	29·78	30·10	29·75	30·77	
0·34	0·57	0·53	0·85	0·53	0·63	0·74	1·10
0·01	0·02	0·03	0·03	0·04	0·02	0·00	0·00
0·82	7·17	0·94	1·14	1·41	1·22	1·17	2·55
0·10	3·67	5·29	0·16	4·79	0·21	5·75	
29·87	29·88	29·86	29·44	30·05	29·74½	30·38	29·81
64	65	65	63	60	55	54	65
43	55	52	44	37	27	27	24
56	67	65	37	54	43	46	
65	69	69	66	65	55	52	69
48	48	48	46	41	33	34	26
57	70	68	56	53	42	47	
56	69	66	37	53	43	46	49
1·41	1·86	2·07	2·47	3·92	4·25	2·43	28·47
0·24	0·56	0·38	0·45	0·53	0·54	0·97	0·97
NNW	NNW.ESE	NW&NE	NNW	NNW	WNW & W	SE	NNW
N	C.C. & N.	C.C. & N.	N.	N. & C.C.	N. & C. C.	N. & C.C.	N. & C. C.
8	9	14	16	18	24	13	161 days
—	—	1	—	3	2	2	20
—	1	3	2	1	—	—	12
—	14	10	5	11	4	11	55
16	13	11	13	13	7	12	176
5	3	3	7	11	8	11	79

METEOROLOGICAL RETROSPECT FOR 1837.

January proved a cold, and from the prevailing epidemic at that time, a most unhealthy month; easterly winds were of constant occurrence throughout the month. The minimum temperature was 24: this year the thermometer has fallen to 16.—*February*, a dismal and gloomy month, constantly rainy or cloudy days. On the 18th an extremely brilliant Aurora occurred, continuing until past midnight. Upwards of three inches of rain fell during the month.—*March* was a month of unusual severity with respect to temperature, snow having rested on the surrounding hills during the whole month; the prevailing wind S.E.; 20 fine clear days, and with an easterly wind, are noted as having occurred.—*April* was a cold and ungenial month; hail occurred on the 3rd, and the heaviest fall of snow for a few hours on the 11th that has happened for some considerable time. The quantity of rain, small, but a continuance of frosty nights characterized the early part of the month, and cold N. and N.E. the days; a meteor was observed on the 16th, traversing from north to south, presenting a brilliant appearance of a ball of fire.—*May*, instead of being the smiling joyous month it was wont to be of old, this year partook of the coldness and backwardness of the season. Fires were to be found in our dwelling-houses even on the 1st of June, and until after that day we had no weather telling us of the near approach of summer. The country severely felt the backwardness and coldness of the season, and the crops suffered; the apple trees alone proving an exception, which in luxuriance and beauty of blossom far outstripped preceding years.—*June* proved a fine and seasonable month, nearly double the number of wet days occurred in the June of 1836. The thermometer this year too stood seven degrees higher; the range for the whole month is, however, the same. The barometer is marked higher in 1836.—*July*. The former part of this month was distinguished by very hot weather, which continued with little intermission until about the 12th, on which the hottest day occurred; rain then fell, and fine weather ensued until the night of the 28th, when we were visited by a very severe storm, commencing from the S.E., which

lasted through the whole of the next day and part of the night of the 29th; the very rapid variations in the barometer were very remarkable on these two days. It proved a warmer and finer month than in the preceding year.—*August.* The early part of this month was fine and hot, the latter for the harvest was not quite so propitious; high winds occurred on three days in the middle of the month. It was remarkable for the uniformly high temperature both here and abroad: in Paris the thermometer, almost every day up to the 20th, standing at 75 and 80 deg. of Fahr.—*September*, though it commenced with rain, proved a very fine month; in fact, a September of the olden time, "a pleasant month, partaking of the warmth of summer, and the vigour of autumn." Stormy and gusty days occurred occasionally in the early part of the month; during the latter part the wind kept steadily to the eastward up to the 18th, and then as steadily to the west.—*October* was one of unusual interest to the meteorologist, the changes being unusually great. The barometer ranged from 30·60 to 29·27; the thermometer from 68·9 to 41. The early part of the month up to the 21st was most delightful, having almost the appearance of a second summer; the illusion, however, passed away, and November assumed her dominion with more than ordinary violence, combining the squally period of the equinox with storms of hail, thunder, and lightning, such as rarely occur in our climate at any season of the year. On the 4th, the unusually large quantity of 0·78th of an inch of rain fell; on the 24th, 0·53; on the 31st, 0·49; and on the 29th, 0·36; making two inches, one-tenth, and six-hundredths of an inch in four days; 3·92 inches occurred during the month. On the 27th, 30th, and 31st, we were visited with very severe gales of wind, and frequent hail-storms; the northern lights were visible on the 18th; on the 13th a total eclipse of the moon was observed; on the whole, however, it was a finer month than in 1836.—*November.* This month proved truly a gloomy one, ushered in by storms and high winds, and rain occurring on twenty-four out of the thirty days. The Aurora Borealis was frequently visible, and at times particularly brilliant and beautiful. Fog and mist were of frequent occurrence; 4·25 of rain fell; in 1836 only 3·11.—*December.* The Christmas of 1837 was a very mild one in point of temperature, and no snow occurred

during the month except a few flakes on the 2nd and 3rd; the month was rather characterized by wet, thirteen rainy days having been registered; the maximum of the thermometer was the same as in 1836; the minimum two degrees higher. Several days of storm and high wind occurred; in fact, on the whole, it was a dreary and wet month.

Swansea, Glamorganshire,
South Wales.

XVIII.

METEOROLOGICAL SUMMARY AT KENDAL, WESTMORELAND, FOR 1837, BY SAMUEL MARSHALL, Esq., PRESENTED BY ROBERT CARR WOODS, Esq., REGISTRAR, MEMBER OF THE GEOGRAPHICAL SOCIETY AT PARIS, &c. &c.

Months.	BAROMETER.			THERMOMETER.			Quantity of Rain in Inches.	No. of Rainy Days.	Prevalent Winds.
	Max.	Min.	Mean.	Max.	Min.	Mean.			
1st Mo.	30·37	29·02	29·68	46°	19°	34°·06	3·431	11	W.
2d ,,	30·05	28·84	29·61	50½	24½	37 ·79	5·840	20	SW.
3d ,,	30·24	28·94	29·75	47	21	34 ·68	1·985	10	N.
4th ,,	30·27	29·00	29·57	56	25	39 ·46	1·610	11	NE.
5th ,,	30·14	29·20	29·72	66	33½	49 ·33	1·195	9	SW.
6th ,,	30·15	29·26	29·78	75½	37	57 ·68	3·610	13	SW.
7th ,,	30·18	28·99	29·77	76	44½	60 ·28	4·730	17	SW.
8th ,,	30·22	29·18	29·77	72	41	57 ·85	3·113	8	W.
9th ,,	30·18	28·93	29·66	67	36	52 ·12	4·181	13	SW.
10th ,,	30·45	28·85	29·79	63	30	49 ·44	5·316	20	W & SW.
11th ,,	30·10	28·69	29·53	53	25½	40 ·04	6·180	23	NW.
12th ,,	30·28	28·94	29·69	51	21	40 ·14	7·201	16	N.
Annual Means, &c.	30·22	28·99	29·69	60·25	29·83	4 6·07	48·392	171	SW.

In my remarks on the Meteorology of 1836, I observed that the distinguishing features of that year were cold and wet. The reverse of these have been the characteristics of 1837. The mean temperature of 5 months at the beginning were certainly below the corresponding ones of 1836. Though the annual mean temperature is below that of 1836, yet the summer and autumn of 1837 were much more genial than the corresponding seasons of the preceding year, which were remarkably wet and cheerless. It is remarkable, however, to see by the tables which I have kept for many years, how little the annual temperature of this or any one year, varies from the annual average, taken for a period of many years; for, however any month may deviate from the mean of that month, yet the balance of temperature is generally found by an inspection of the whole year to be restored. The same remarks apply also to the weight of the air as denoted

by the barometer. The annual mean for 1837 varies from the mean of 13 years by + 0·05 inch only; and the temperature by — 1°·24 for the same period. The winds during the greater part of the spring were E. and NE. and they prevailed to such an extent, that vegetation was so far impeded, as to have made very little progress at the end of the 5th month. The aurora borealis was very brilliant several times during the first three and the last three months of the year. In almost every instance, the streaks of light were of a *deep red colour*, generally commencing in the East, and proceeding to the West, and then disappearing. On the 18th of the 10th month, it was peculiarly splendid. Whilst there were steady streams of light which appeared to issue from a cloud in the North, there was a mass of red light in the N.E. (not in the East) stretching towards the zenith. This very gradually disappeared from that part, whilst it seemed to tinge the streaks of light slightly in its passage to the West by the North, and then appeared even more red, and of a fine ruby colour in the West. This appearance continued about half an hour, from 7 to half-past 7, P.M. Several streaks of white light stretched from E. to W. nearly through the zenith, but never formed themselves into an arch. The quantity of rain is less than any other annual quantity since 1829, and in nine months of the year, the quantity has fallen short of the monthly means; in the 2d, 7th, and 12th months, the quantity a little exceeded the means for these months. For four years preceding 1837, I ascertained that more rain fell at Kendal than at Birklands, though only about a mile distant, and about 30 yards higher than Kendal. I have not been able to ascertain the amount for 1837. By the kindness of Thomas A. Beck, of Esthwaite Lodge, I find that though the number of days on which rain fell at his residence amounts to 177 or 6 days more than in Kendal, yet the quantity measured there in 1837 was 69·146 inches, or 20·754 inches more than at Kendal! Our gauges are precisely the same, having been compared with each other, and I have reason to conclude that equal care is bestowed on each. Local circumstances constitute the difference. Esthwaite Lodge is distant about 12 miles WNW. from Kendal, and about 494 feet from the margin of Esthwaite Lake. It is situated at the base of a ridge of hills which extends from the river Brathey at Elterwater in the North, to the junction of the rivers Crake and

Leven in Morecombe Bay. Another shorter range stretches from Windermere and Esthwaite Lake connecting itself with the former range to the South, a short distance below the foot of Esthwaite. To the West of Esthwaite is Coniston Lake; and to the West of the latter is a grand mass of mountains tumbled about in glorious confusion, their chief being the towering Old Man, rearing his mighty head 2577 feet above the sea,—a grand attraction to fleecy vapours, as well as to rambling tourists. These mountains fill up the space between Coniston Lake and the river Duddon, and are of various heights, but diminish in size as they approach the plains of Low Furness, as if gradually to entice the marine vapours upwards. Westward again of these, are the Cumberland mountains, Blackcomb and Stoneshead Fells. The former, the most South, and 1919 feet high, are the first to catch and *tap* the clouds which the prevalent westerly winds waft from seaward. To the North of Esthwaite, the longitudinal valleys are shut in by the majestic boundary at Windermere;—the mountains Kirkstone, Langdale Pikes, &c. contributing by their attractive efforts to delay the clouds in the neighbourhood, and thus, by their deposites to refresh the thin and thirsty soil with that abundant moisture which is required to cover it with verdure. Esthwaite Lodge, it thus appears, is embosomed in mountains, and nearly an equal distance from Windermere and Coniston Lakes. Its height above Esthwaite Lake is 19 feet, and above the level of the sea 215 feet. The preceding particulars have been furnished to me by T. A. Beck, and when they are taken into the account, they will sufficiently explain the cause of the surprising deposit of moisture at so short a distance from this place. Now, though it is a fact sufficiently well established, that more rain falls in low situations than in more elevated ones, even when contiguous, yet other and more powerful causes interpose in this case to reverse the conclusion, so far as the comparison is concerned between Kendal and Esthwaite.

Since writing the preceding sentence, I have seen a paragraph in a provincial paper, giving some account of a lecture delivered last week by Professor Phillips of King's College, London. The learned Professor stated, that for the last five years, a series of experiments had been conducted by himself and Wm. Gray, jun., at the instance of the British Association. They had

3 rain gauges placed in York, one at the top of the Minster, one at the top of the Museum, and one at the bottom of the Museum. Every experiment supported the theory above stated, and while 30 inches of rain had fallen on the ground, only 18 had fallen at the top of the Minster. By the kindness of a friend, I have been furnished with an account of the quantity of rain taken in York during the last year, by which it appears, that whilst we have had 48·392 inches, (much less than our usual quantity,) there have been but 23·99 inches, or less than one-half. At Worcester, the quantity has been 24·46 inches. At Manchester, about the same distance from Kendal as York, the annual average is 30 inches, while ours is 58 in round numbers. The cause is probably the same in all the three instances,—that the aqueous vapours are arrested in their progress before they reach these places, by eminences lying to the West of each respectively, whilst those brought by the most prevalent winds here, the W. and SW. are arrested by the mass of mountains in our immediate neighbourhood, and are deposited in large quantities. I now subjoin in parallel columns, the quantities taken in each month at Esthwaite Lodge and at York, the contrast between which is very striking. I regret I cannot add the number of rainy days in each month for both places.

1837.	Esthwaite Lodge. Inches.	York. Inches.
1st Month	5·323	3·09
2d „	8·379	2·21
3d „	2·776	0·86
4th „	3·238	2·01
5th „	1·133	1·14
6th „	6·604	1·21
7th „	5·716	3·89
8th „	3·409	1·31
9th „	5·175	1·80
10th „	8·530	1·76
11th „	9·662	1·28
12th „	9·201	3·43
	69·146	23·99

Kendal, 5th, 2d mo. 1838.

XIX.

METEOROLOGICAL SUMMARY FOR 1835 & 1836, AT KENDAL, WESTMORELAND.

ARRANGED BY ROBERT CARR WOODS, ESQ., REGISTRAR, &c. &c. &c.*

MONTH.	MEAN BAROMETER.		MEAN TEMPERATURE.		RAIN IN INCHES.		PREVAILING WINDS.	
	1835.	1836.	1835.	1836.	1835.	1836.	1835.	1836.
January	29·77	29·59	34°74	37°53	5·349	3·938	SW	SW & W
February	29·41	29·56	40·35	37·50	8·820	3·915	W	W
March	29·69	29·19	41·09	40·13	5·04 9	6·344	W	W
April	29·88	29·62	46·28	44·11	1·589	2·836	W	W
May	29·62	30·06	50·02	50·79	3·063	0·053	W	NW
June	29·85	29·63	57·49	56·84	1·254	7·998	SW	SW
July	29·51	29·69	58·44	56·95	6·259	9·052	W	W
August	29·77	29·80	60·21	55·47	3·107	3·761	W	SW
September	29·44	29·63	53·20	51·48	7·815	5·900	SW	SW
October	29·51	29·52	46·47	45·67	4·386	3·967	NW	W
November	29·67	29·30	41·84	29·23	6·311	8·009	W	W
December	29·89	29·53	38 17	38·04	2·889	8·551	W	SW
MEAN.	29·66	26·59	47·35	46·14	55·891	64·327	W	W

* I have added this table to Mr. Marshall's Summary for 1837, that the reader may compare the observations made at this interesting part of England with the statement contained in Mr. Gough's paper on "The probable causes of the vernal winds as they prevail at Kendal," &c. page 67.

XX.

METEOROLOGICAL SUMMARY AT THETFORD, NORFOLK, 1837. BY H. W. BAILEY, Esq. M.R.C.S., &c.

1837.	THERMOMETER ON THE GRASS.				SOLAR RADIATION.		
	Highest.	Lowest.	Mean.	Midnight Mean.	Highest.	Lowest.	Mean.
January	44°	22°	33°	35°	72°	41°	56½°
February	44	22	33	35	72	41	56½
March	35	14	24½	28	70	41	55½
April	42	20	31	36½	82	43	61½
May	44	26	35	42½	98	52	75
June	56	32	44	50	106	68	87
July	54	30	42	52	102	69	85½
August	59	32	45½	52	100	59	79½
September ..	59	30	34½	52½	100	59	79½
October	50	24	37	45½	92	62	77
November ..	46	15	30½	36	77	37	57
December ..	48	18	33	38	65	33	49

1837.	SCALE OF WINDS.									
	N.	NE.	E.	SE.	S.	SW.	W.	NW.	No. of Days.	Phenomena.
Jan.—A.M.	1	4	5	—	9	4	6	2	31	14 Windy.
P.M.	1	4	4	—	9	5	5	3		18 Sn. & hail.
Feb.—A.M.	1	—	1	7	5	9	2	3	28	12 Rainy.
P.M.	1	—	—	7	5	11	—	4		17 Windy.
Mar.—A.M.	10	3	—	2	—	7	2	7	31	13 Rainy.
P.M.	13	1	1	—	—	8	1	7		6 Windy.
April—A.M.	5	4	1	1	5	8	1	5	30	15 Windy.
P.M.	4	5	1	1	1	10	2	6		21 Rain.
May—A.M.	9	2	3	2	6	3	—	6	31	14 Rainy.
P.M.	8	3	2	3	6	2	2	5		11 Windy.
June—A.M.	5	6	3	—	4	3	4	5	30	6 Windy.
P.M.	3	8	4	1	5	4	3	2		9 Rain.
July—A.M.	5	4	3	1	4	6	3	5	31	10 Windy.
P.M.	1	6	3	1	5	6	4	5		13 Showery.
Aug.—A.M.	2	2	7	3	3	2	5	7	31	13 Rain.
P.M.	1	6	6	3	3	1	6	5		15 Wind.
Sept.—A.M.	1	5	5	4	2	5	4	4	30	18 Windy.
P.M.	2	6	6	2	5	4	4	1		15 Rainy.
Oct.—A.M.	2	1	1	12	7	7	—	1	31	11 Windy.
P.M.	2	1	2	11	8	7	—	—		14 Rainy.
Nov.—A.M.	2	2	—	8	1	4	7	6	30	10 Windy.
P.M.	5	1	—	9	2	6	5	3		14 Rainy.
Dec.—A.M.	—	4	4	2	12	3	4	2	31	
P.M.	1	5	3	2	11	5	3	1		

XXI.

ATMOSPHERICAL DISEASES AT THETFORD, NORFOLK.—BY H. W. BAILEY, Esq., M.R.C.S. &c.

1837.

JANUARY.—This month will be recorded in times hereafter as having a peculiar epidemic of a more general and universal nature than has occurred in the memory of the oldest inhabitant;—influenza attacking all ages and classes of persons, commencing with cold chills, pains through the frame, violent cough, dreadful soreness of the muscles concerned in respiration, and the tongue throughout has been universally clean, the skin suffused with perspiration, and the pulse soft and natural in frequency. The greatest prostration of strength accompanied these symptoms, along with a sense of suffocation and pain across the chest. In old persons, in whom there is not much strength, it has become fatal very quickly from suffocation, and also in young children it has terminated fatally. In many instances it has been attended with ulceration in the mucous membrane of the mouth, with a remarkably thick loaded tongue, adding much to the sufferings of the patient. In some very plethoric or asthmatic persons, active inflammation of the chest has been produced, but generally this has not been the case; the epidemic not putting on an inflammatory type, and consequently requiring great caution in the treatment of it. In the numerous cases under my care I have not found it practicable to bleed; on the contrary, the system has required support. But few casual diseases this month.

FEBRUARY.—Still the epidemic rages, continuing with the same characteristic type, and may generally be looked upon as an adynamic congestion of the pulmonary system. From the accounts from all parts of the kingdom this appears to be the case; if one can judge from the mode of treatment,—being the opposite to diseases of an inflammatory kind. In the cases examined after death, there appear no traces of inflammation, but the pulmonary cells are completely filled with frothy mucous, and the fauces vascular from the limitation of the air passages. The disease has generally continued from four to twelve or

fourteen days, leaving the subject most alarmingly debilitated, and in all probability leaving the system liable to inflammatory attacks in the Spring season.

Many cases of rheumatism have come under observation; some of which had been attacked with the epidemic, and requiring the greatest vigilance on the part of the practitioner to carry them through so serious a disease. Sore throats and hooping coughs have been also prevalent, and many children have died from the severity of the attacks. Towards the latter end of the month the cases lessened in number, but still a great many were affected, and among those who were unattended, the disease was exceedingly protracted, leaving the system greatly exhausted.

March.—Very few cases of influenza came under observation this month, and those were probably kept up by the cold and fickle state of the weather. In many it has left a great disposition to disease, and at this season, when inflammatory complaints come on, many are severely affected.

Pneumonia and pleuritis have occurred of a severe nature; the system having been so greatly debilitated from former disease. Amongst children, pectoral complaints are very general. Coughs and catarrhal fevers are very prevalent; sore throats, &c. &c.

April.—In consequence of the cold winds, and frequent showers, young children have been seized with inflammation of the chest, and that occurring while having the hooping cough, has caused a mortality amongst them. Enteritis in one case, with subsequent ascites, in a shepherd.

Some cases of influenza are still under treatment, but appear of a more mild character, and are going off much sooner. Rubrola, scarlatina, with putussis, are the epidemical diseases now prevailing, and these chiefly in children.

May.—Diseases, chiefly catarrhal affections, amongst those most disposed by previous attacks of influenza: in some cases many inflammatory symptoms presented themselves, affecting the mucous membrane of the mouth and air passages, and requiring very active treatment.

Several cases of pleuritis of a severe kind have come under

observation, and some returns of influenza, especially amongst the higher classes. Rheumatisms and sore throats have been prevalent, and some cases of common fever.

JUNE.—Some few cases of influenza of a somewhat severe kind came under notice, and occurred in those who had previously been slightly attacked. It left great prostration of strength, and some asthmatic tendency, which continued for some time.

Pleuritis, pneumonia cynanche tonsillaris and rheumatism have been prevalent.

JULY.—During this month rubrola has been general both in children and adults, and several cases of secondary forms of this disease have presented themselves. The disease has been very mild, the cough light, and congestion but trifling.

Rheumatitis has also been prevalent, and bowel complaints became somewhat general.

Three cases of consumption have terminated fatally, and two cases of hemoptysis came under treatment. Some catarrhal affections occurred in those elderly persons who have had influenza, and which proved nearly fatal from the want of power to expectorate. Cynanche tonsillaris, and two cases of gout, are the atmospherical diseases of this month.

AUGUST.—Diseases continue the same as in the last month. Rubrola has been more prevalent than for many years past, and several cases of roscola and scarlatina have also been under treatment.

Variola has made its appearance; in some families it has attacked those who had been previously vaccinated, but its effects were in consequence milder.

Asthma has been very severe in persons predisposed to it, arising chiefly from the cold and wet weather. Numerous cases of cynanche tonsillaris have been under observation. Rheumatism, both chronic and acute, have attacked the labouring classes. Several cases of spasmodic colic and cholera morbus, have occurred from eating fruit, &c., but which did not require any active treatment, and easily gave way to absorbents and opium.

SEPTEMBER. — Vaccination has now become general in consequence of the small pox attacking so many,—not even allowing those who had been vaccinated to escape. Measles are still very prevalent. Congestion, and an inflammatory state of the lungs, are severe; which in some cases have proved fatal. Fevers of a continued kind attacked both the higher and the labouring classes; some cases of inflammation have occurred.

Rheumatitis still attacks many,—continuing for some time, and affecting every limb. Diarrhœa and colica spasmodica are general, from an immoderate use of fruit.

OCTOBER.—From the fair state of the weather, diseases are not so numerous as they usually are this month. Small pox is still gradually insinuating itself among persons unprotected by vaccination; but to show the prophylactic powers of vaccination, a portion of a family were seized with small pox, the remaining branches were immediately vaccinated, and thus escaped its contagion; in other parts of the town similar instances are recorded.

Measles are still with us, but of so mild a nature as to require little attention. Fevers of a common kind, arising from the vicissitudes of the season, have attacked the most indigent of the poor. Some severe cases of diarrhœa, which occasioned great prostration of power, have, by absorbent and anodyne medicines, been overcome.

NOVEMBER.—This month may be considered very healthy. Small pox and measles still continue, though mildly; the former much modified by vaccination. Many cases of rheumatism in poor people required very active treatment. Fevers of an inflammatory kind, and scarlatina, were the monthly epidemics.

DECEMBER.—The small pox still continues among the lower classes. Persons who have been recently vaccinated, as well as those of long standing, have alike been subject to its attacks.

Fevers of a common kind, and rheumatism, both acute and chronic, have been very frequent,—also diarrhœa, arising from the extreme cold.

XXII.

NOTICE OF A LUNAR RAINBOW SEEN AT LONDON ON SUNDAY, 29th JULY, 1838.—BY ROBERT CARR WOODS, ESQ.

A LUNAR rainbow is an exceedingly rare phenomenon. I have seen accounts of but three which have been observed; they are described in the Transactions of the Royal Society. On each occurrence the moon was at the full; but the bow, or, rather, a segment of one, which appeared on the evening of Sunday, July 29th, was visible at three hours fifteen minutes after the moon had entered the first quadrature, i. e. 9 hours 10 minutes P.M. The segment of the bow was seen about east-south-east:—it was formed by the moon's northern limb or horn, being well defined on some black vapour clouds, without colours, and resembling a silver horn upon a dark banner. The moon shone with unusual splendour, though it was raining heavily at the time. The eastern horizon was entirely overcast. Being unwell, and returning home when the bow appeared, I regret I had not an opportunity of minutely observing this singular phenomenon. At three o'clock in the afternoon of the same day, there appeared a treble solar rainbow, displaying in beautiful, but reversed order, the prismatic colours. It was showery throughout the day; on the following day, at noon, the sound of thunder was distinctly heard.

London.

XXIII.

MAXIMUM, MINIMUM, AND MEAN TEMPERATURE, PRESSURE, AND DEW POINT FOR EACH MONTH IN 1837, AT GREAT MALVERN, WORCESTERSHIRE. BY WILLIAM ADDISON, Esq., M.R.C.S. F.L.S., &c. &c.

The following tables refer to the village of Great Malvern, eight miles from Worcester, situated 520 feet above the mean level of the sea, above which the adjoining hills rise about 920 feet more. Great Malvern commands a most extensive view over the vale of the Severn. The mean temperature deduced from three years' observations is 48°·1 Fahr.

The mean difference in the barometer between Malvern and London is about 0·570 inches, owing entirely to the elevation of the former place.

The general fact is, that on the hills at Great Malvern, the temperature does not rise so high as it does in the vale in summer, nor does it often fall so low in winter. With the thermometer in my hand I have remarked, on ascending the hill, a difference of 15° in a distance less than a quarter of a mile!

At such times when the thermometer is several degrees lower in the vale than on the hill, there is usually a calm still air in the former situation, with much dew or hoar frost; whereas in the latter the wind is frequently blowing strong, and there is little or no dew or hoar.

TEMPERATURE.

1837.	Max.	Min.	Mean Max.	Mean Min.	Mean Temperature.
January .	51°	26°	41°2	34°7	38°
February .	55	27	45·5	36·2	40·8
March .	48	22·5	40·4	30·2	35·3
April .	58	24·5	45·8	33·1	39·5
May .	68	32·5	57·1	42·6	49·8
June .	74	38	66	50·9	58·4
July .	75	45	69·5	54·2	61·8
August .	73	44	66·8	52·8	59·8
September	68	42	60·5	48·6	54·5
October .	68	32·5	57·4	45·6	51·5
November	55·5	28	47·1	37·5	42·3
December	55	28	44	38·5	41·2

Mean for the year 47·7

Winter .	39·3
Spring .	41·2
Summer .	60
Autumn .	49·4

MEAN BAROMETER.

1837.	Max.	Min.	Mean.
January . .	30·035	28·735	29·374
February . .	29·800	28·600	29·386
March . . .	29·900	28·702	29·450
April . . .	29·918	28·830	29·280
May . . .	29·852	29·076	29·461
June . . .	29·830	29·034	29·520
July . . .	29·838	28·654	29·467
August . . .	29·914	28·980	29·525
September . .	29·876	28·600	29·413
October . .	30·228	28·828	29·643
November . .	29·930	28·450	29·390
December. . .	30·040	28·830	—

Mean for the year 29.447 { Winter 29·322; Spring 29·397; Summer 29·504; Autumn 29·482

MEAN DEW POINT AT 9 A.M., (DANIELL'S HYGROMETER.)

1837.	Max.	Min.	Mean.
January . .	49°	23°	37°·2
February . .	49·5	20	38
March . . .	41	22	30·5
April . . .	50	22	34·2
May . . .	49	31	41·7
June . . .	60	42	52·3
July . . .	63	42	55
August . . .	64	45	56·8
September . .	61	45	53·1
October . .	60	33	49·4
November . .	52	30	40·3
December . .	53	29	—

Great Malvern.

XXIV.

METEOROLOGICAL PHENOMENA OF NOVEMBER 12—13, 1837, AT DUNDEE. BY WILLIAM GARDINER, Esq. COMMUNICATED BY W. H. WHITE, Esq. Hon. Sec.

Nov. 12.—Day fair and clear; wind N.W.

30′ past 4 P.M.—A broad auroral stream of a deep blood-red colour shot up from the east, and reached beyond the zenith, covering, but not obscuring the star Vega. It soon afterwards extended towards a range of clouds in the western horizon, where it was lost. This splendid blood-red luminous arch was very vivid, but ill-defined, and exhibiting throughout its length many little curvatures.

30′ past 5 P.M.—A streamer branched off from the arch a little to the south of the zenith, and formed an acute angle with its western limb. Shortly after, streamers spread on all sides forming a magnificent crown; but those towards the east and west (being the original bow) were most brilliant.

6 P.M.—Streamers and arch gone, and only a few crimson waves playing about a little above Ursa Major, and extending from a little to the east of that constellation to a considerable distance westward. Air very cold.

45′ past 7 P.M.—Luminous arch again formed with streamers branching from it about the zenith. The arch itself ill-defined as before; the eastern limb crimson; the western crimson, orange, and green. The streamers partaking of all these colours, as well as the usual white tint. The range of clouds in which the western limb was lost higher than before. Wind north-west; cold. Moonlight clear;

but the aurora very brilliant. Stars seen as brightly through the deepest tints of the aurora as if nothing intervened.

30′ past 8 P.M.—Arch broken, portions of both limbs remaining; the eastern one rather faint; the western bright and much expanded in breadth. Both blood-red or crimson.

9 P.M.—Auroral crown formed, with the exception of streamers to the south. Colours crimson, green, and yellowish-white. Frost strong.

10 P.M.—Abundance of streamers from north, north-east, and north-west, mostly yellowish or greenish, with a reddish tint towards the east, where the eastern limb of the arch was.

45′ past 10 P.M.—Whitish streamers crossing each other in the eastern part of the heavens, from north to south, and from north-east to south-west, at an angle of about 75°.

45′ past 11 P.M.—White lunar halo about 14° in diameter; auroral streamers faint; hazy, and many clouds, especially to the west and north.

12 midnight.—Halo gone, except a few fragments. Many cumulus clouds about the moon, and stretching away to north-west.

Nov. 13. 38′ p. 12 A.M.—A shooting star of a bluish colour, without train, and of the size of a star of the second magnitude, shot from Leo Minor a few degrees north of Regulus, towards Ursa Major. It vanished in an instant, passing with the greatest velocity over only a few degrees.

Soon after this meteor was seen, the sky became obscured by clouds, and not a constellation nor even a solitary star was visible, except Regulus for a short time, and the planet Jupiter.

Between 3 and 4 A.M.—The sky again cleared, and Leo was attentively observed till 30 minutes past five; but only two meteors were seen, neither of which emanated from the radiant

point of the *meteoric showers*, nor were they accompanied with trains. One appeared at thirty minutes past three, near a star to the south of Regulus, and passed in the direction of the Great Bear. The other appeared at five, in the hind leg of Leo, and passed towards the north-east. Both were of a bluish colour, and appeared only for an instant; the former the size of a star of the second magnitude, and the latter the size of one of the first.

All traces of auroral phenomena had disappeared.

9 A.M. Wind W.—An imperfect solar halo, intersected by long streaks of white clouds radiating in all directions.

2 P.M.—Overcast; lower current of wind E.

9 P.M.—Sky obscured by a dense hoar frost, so as to render watching for meteoric phenomena this night impracticable.

Nov. 14. 8 A.M.—Heavy rain; wind E. Much rain during the night.

3 P.M.—Fair since 30 minutes past 9 A.M.; wind N.E.

Nine members of the Dundee Watt Institution assembled at 9 P.M. on the 12th November, and kept attentive watch of the sky till half-past five A.M. of the 13th, each in rotation watching for a quarter of an hour. The result was (as the above report shews) that although many auroral phenomena occurred, there was *no meteoric shower;* on the contrary, there were fewer shooting-stars than are usually seen on ordinary nights.

Dundee.

XXV.

NOTICE OF A RARE METEOROLOGICAL PHENOMENON, viz., A SHOWER OF RAIN WITH A PERFECTLY CLEAR SKY, AT GENEVA, ON THE 31st OF MAY, 1838. BY PROFESSOR WARTMANN, ASSOCIATE MEMBER.—TRANSLATED BY W. H. WHITE, ESQ. M.B.S. Hon. Sec.

The whole of the 31st of May had been characterized at Geneva by sudden atmospheric changes, sometimes large black clouds extremely agitated, covered the sky from one horizon to the other, producing at intervals, heavy showers of rain mixed with small hailstones, and accompanied by claps of distant thunder.

Sometimes the sky was cloudless, and the sun shining with all its brilliancy for the space of half an hour; after which, and almost instantly, new masses of clouds appeared in the horizon, and quickly covered the whole heavens, producing a heavy shower. The clouds then yielded to an extraordinary dispersive force, and left the sky perfectly unclouded again in a few minutes.

These sudden changes of the weather from clear to cloudy, and from rain to sunshine, continued all the day, during which a SW. wind had at times blown with violence, but in the evening it had sunk into a perfect calm. What appeared to be very remarkable was, the barometric column scarcely oscillated during the whole day of these singular paroxysms.

The barometer at the observatory, reduced to the freezing point of Fahr. indicated at 9 A.M. 28·682, at noon, 28·681, at 3 P.M. 28·684, and at 9 P.M. 28·715. Thus, as we see, the limits of variation have been very restrained. Not so the temperature, which fell suddenly to 48°·2, the maximum of the day having been 71°·7, and the minimum 53°·8 Fahr.

The hygrometric state of the atmosphere indicated considerable variations. Saussure's hygrom. at 9 A.M. was 88°, at noon 79°, at 3 P.M. 67°, and at 9 P.M. 86°.

The same day, as I was walking upon the quay of the Rhine, at 7h. 2m. P.M., there came on a sudden shower of rain, which

continued for six minutes, under circumstances which astonished every one present. The drops at the commencement of the shower were large and compact, but they became smaller until the complete cessation of the phenomenon. This rain, the temperature of which was lukewarm, fell vertically from a sky perfectly clear in the zenith, and without any apparent cloud in the visual horizon; a thermometer placed at $3\frac{1}{2}$ feet above the earth, indicated at that moment 65°·3 Fahr. The air was calm, and the moon, without any cloud to obscure it, was shining nearly on the meridian.

This rain had great analogy to that which fell here, with a perfectly clear sky, and an atmospheric temperature of 70°·5 Fahr. on the 9th of August last year at 9h. 15m. P.M. which continued about two minutes, and was repeated several times in different parts of the city at intervals of half an hour.

It is a remarkable fact, that in both cases the zenith was cloudless, the air clear, and without agitation, the first drops of rain that fell were large, and of a warm temperature. It is also further remarkable that the former of these rains took place at $9\frac{1}{4}$h. P.M. when the thermometer in the open air was 70°·5 Fahr. and the latter at 7h. 2m. P.M. the thermometer being 65°·3 Fahr. consequently, they both occurred at the close of the day, and under very different atmospheric temperatures.

It appears, however, that this singular phenomenon is produced in the night as well as in the day, in summer as well as in winter, but it remains to be determined if it could occur at a very low temperature.

The late Professor M. A. Pictet of Geneva, (who was a Member of the Meteorological Society) once witnessed a similar shower in the night between the 6th and 7th of January 1791, at 1 hour after midnight. He says, that the heavens were perfectly clear, there was not the least mist, and the wind was very gentle; but he did not know the temperature of the air at the time. On lately referring to the meteorological tables published in the ancient *Journal of Geneva*, I find that on the 6th January 1791 at sun-set the thermometer stood at 38°·7 Fahr. and the next morning at sun-rise it was at 40°·2, therefore, it seems probable that at the moment of the shower of rain, observed by M. Pictet, the temperature of the air was below Zero of Reaumur (32° Fahr.)

XXVI.

SYNOPSIS OF A METEOROLOGICAL JOURNAL KEPT IN THE CITY OF NEW YORK, FOR THE YEAR 1837, INCLUDING THE AVERAGE RESULTS OF THE LAST FIVE YEARS.—BY W. C. REDFIELD, ESQ., ASSOCIATE MEMBER.

The observations which I have made on the direction of the wind near the earth's surface, and also on the direction of the highest observed clouds, at periods of four hours' duration, commencing at 6 A.M., and ending with 10 P.M., are comprised in the following Table.*—

Monthly results for the year 1837.	Direction of the Wind at the surface, in periods of four hours each.				Direction of the highest observed current in the region of clouds.			
	Observations of wind from NE. quarter, including N.	From SE. quarter, including E.	From SW. quarter, including S.	From NW. quarter, including W.	Observations of clouds from NE. quarter, including N.	From SE. quarter, including E.	From SW. quarter, including S.	From NW. quarter, including W.
January	21½	1	35½	85	3	0	51	78
February	14	7½	56	53	7	0	66	27
March	48½	32½	38	32	8	1	62	43
April	35	22	49	43	5½	1	49½	49
May	21½	58	33	34	5	11½	77	34½
June	24	34	73½	13½	13	0½	44	23½
July	10½	20	79½	29½	3½	6	51	55½
August	18½	36	48½	44	0	0	48	20
September	33	28	43	35	11	5	67	27
October	45½	15½	43½	41½	4	8	72½	32½
November	6	13	72½	51½	0	0	40	54
December	32½	1½	58½	61	0	0	51	62
No. of observa....	310½	269	630½	523	60	33	679	506
Propor. in 1000...	179	155	364	302	47	26	531	396
Average proportion in 1000 for the last five years, 1837 inclusive	219	127	388	266	55	21	593	331

Average proportion of easterly winds in 1000, for five successive years 346

Average proportion of westerly winds for the same period 654

The westerly surface winds being to the easterly *nearly as two to one.*

* For a summary of observations from 1833 to 1836 inclusive, see Reports of the Regents of the University of the State of New York, for the years 1835 and 1837.

Proportion in 1000 of easterly winds in the region of clouds for five years 76
Proportion in westerly winds for the same period . . 924

The westerly winds being to the easterly, in the region of clouds during this period, *nearly as twelve to one.*

From the foregoing synopsis of observations, it appears that the main current of atmosphere prevailing in this region is from the south-western or western quarter. This may account for the general uniformity of the course pursued by our storms, of almost every description.

TABLE OF THE MONTHLY MEAN HEIGHT OF THE BAROMETER IN ENGLISH INCHES, FOR EACH OF THE FIVE DAILY OBSERVATIONS RECORDED DURING THE YEAR 1837 : TO WHICH IS ADDED, THE AVERAGE RESULTS OF THE LAST FIVE YEARS, 1837 INCLUDED.

1837.	Mean of Barometer at 6 A.M.	at 10 A.M.	at 2 P.M.	at 6 P.M.	at 10 P.M.	Monthly Mean.
January . .	29·855	29·908	29·854	29·874	29·890	29·876
February . .	30·022	30·039	30·014	30·021	30·035	30·026
March . .	30·210	30·245	30·210	30·199	30·225	30·218
April . .	29·924	29·949	29·895	29·907	29·960	29·927
May . .	30·035	30·075	30·041	30·032	30·058	30·048
June . .	29·950	29·960	29·950	29·931	29·951	29·948
July . .	30·011	30·027	30·002	29·985	30·005	30·006
August . .	30·086	30·094	30·075	30·068	30·087	30·082
September .	30·262	30·282	30·243	30·234	30·256	30·255
October . .	30·259	30·272	30·239	30·281	30·273	30·265
November .	30·160	30·193	30·156	30·168	30·189	30·173
December . .	30·167	30·193	30·144	30·181	30·214	30·180
Annual results .	30·087	30·103	30·069	30·073	30·095	30·085
Average do. for 5 years	30·097	30·118	30·086	30·083	30·105	30·098

In the foregoing table no correction is made for temperature or for variation in the surface level of the cistern. The annual mean of the attached thermometer is supposed to be about 68° Fahrenheit, and the capacity of the tube to that of the cistern is as one to forty. The capillarity of the instrument is provided for in the Zero adjustment, and its position is about ten feet above the ordinary sea-level.

A TABLE SHOWING THE MONTHLY MAXIMUM AND MINIMUM OF THE BAROMETER AT NEW YORK FOR THE YEAR 1837.

1837.	Monthly Maximum and date.		Monthly Minimum and date.		Monthly Range.
	In.	Dec.	In.	Dec.	In. Dec.
January.....	30·37	on the 13th	28·83	on the 21st	1·54
February	30·57	,, 13th	29·27	,, 23d	1·30
March	30·57	2d & 11th	29·63	,, 18th	0·94
April	30·40	,, 28th	29·12	,, 8th	1·28
May	30·40	,, 2d	29·63	,, 6th	0·77
June	30·20	,, 29th	29·60	6, 7, & 20th	0·60
July	30·35	,, 17th	29·74	,, 24th	0·61
August	30·49	,, 6th	29·70	,, 30th	0·79
September	30·67	,, 24th	29·83	,, 11th	0·84
October	30·73	,, 9th	29·87	,, 20th	0·86
November	30·70	,, 28th	29·18	,, 22d	1·52
December	30·63	,, 23d	28·98	,, 18th	1·65
Annual Results.	30·73	Oct. 9th	28·83	Jan. 21st	1·90
Do. correc. for variation in level of cistern, 1·40.	30·75		28·81		1·94

The irregular fluctuations of the barometer during the year 1837 have been somewhat remarkable. For the first ten days in January, which included alternations of stormy weather, the mean of the barometer was only 29·68 in. But the mean of the first ten days in March was 30·47 in., this being a period of variable weather, with heavy gales on the Atlantic, passing near our coast. From the 18th of September to the 18th of October, an entire month, the mean of the barometer was 30·32 in., the mercurial column having but once in this period fallen to 30 in. for a single observation, although several violent storms traversed the southern coasts of the United States and over the North Atlantic during this period, on routes not greatly distant from this part of our coast. Other periods during the summer and autumn were distinguished by similar results. This may show that while the barometer is known to fall when under the rotative action of these storms, a contrary effect is produced upon the exterior border of the storm; a fact which might be inferred from the known rotative character of these gales.

New York, February, 1838.

XXVII.

METEOROLOGICAL SUMMARY FOR 1837, AT DUNDEE; BY LIEUT. J. N. SMART, R.N.

1837. Months.	Days.	SCALE OF WINDS AT HIGH WATER.										No. of Tides.	THERMOMETER.		Highest Tide in each Month.
		N.	N.toE.	E.	E. to S.	S.	S.toW.	W.	W.toN.	Calm.	Variab.		High W.	Noon.	ft. in.
January . .	31	—	7	5	7	—	7	10	22	2	—	60	32°43	38°40	9th. Light breezes, NW. 19 3
February .	28	—	3	2	3	1	9	11	15	10	—	54	40·53	42·23	8th. Do. do. WSW. 19 2
March . . .	31	4	15	1	2	—	11	6	17	4	—	60	37·10	42·2	10th. Do. do. NNW. 19 3
April	30	4	18	3	14	—	4	5	9	1	—	58	41·20	46·26	6th. Do. do. N. by E. 18 3
May	31	6	10	3	16	1	9	7	7	—	—	59	49·49	61·2	4th. Do. do. NW. 18 3
June	30	1	7	7	7	1	12	4	16	3	—	58	58·10	62·56	19th. Do. do. SW. 18 2
July	31	—	6	10	15	1	8	6	6	8	—	60	60·19	64.55	19th. Fresh breezes, E. 18 6
August . .	31	1	9	7	9	1	9	5	13	5	1	60	57·14	63·30	19th. Light breezes, W. by N. 19 2
September	30	3	10	3	15	—	10	4	13	—	—	58	53·48	57·56	17th. Do. do. NE. 19 10
October . .	31	1	1	—	2	—	23	12	21	—	—	60	52·17	57·52	12th. Do. do. W. by N. 19 1
November.	30	—	1	1	2	—	13	5	32	4	—	58	41·24	44·00	12th. Fr. breezes, NW. by N. 19 3
December.	31	—	6	4	9	4	8	10	15	—	4	60	43·24	43·54	30th. Light breezes, ESE. 18 3
No. of Days	365	20	93	46	101	9	123	85	186	37	5	705	Average for Year. 47·41	52·41	

SUMMARY OF THE MONTHS AT DUNDEE, 1837.

January. This month was favourable for the season of the year, until the 27th, when it became unsettled and stormy, and continued so to the end, blowing strong, with snow, sleet, and rain. The lowest state of the thermometer was on the evening of the 11th and morning of the 12th, when it stood at 27°.—*February.* This month was very changeable. The lowest state of the thermometer was 29°, on the morning of the 26th.—*March.* This month, like its predecessor, was disagreeable and changeable throughout; on the 29th, at 6 A.M., the thermometer was 23°.—*April.* This month was changeable and ungenial for the season. The lowest range of the thermometer was 31°, the highest 58°.—*May.* The weather this month was changeable and cold for the season. The prevailing winds being easterly, has kept it colder than we generally have it in May. The lowest state of thermometer 38°, highest 68°.—*June.* The weather this month was cold and changeable, with a good deal of rain. Lowest state of thermometer 44°, highest 79°.—*July.* This was a tolerable good month upon the whole. On the 13th it began to rain, which lasted three days, and at the end of the month we had some heavy rain. Highest state of the thermometer 77°, lowest 52°.—*August.* We had a great deal of rain the beginning of this month, but it kept a pretty equal temperature upon the whole month. Highest state of the thermometer 74°, lowest 46°.—*September.* This month throughout has been mild and pretty equal in temperature. The highest state of the thermometer 66°, lowest 43°.—*October.* This month was dry, mild, and pleasant, until the 27th, when we had a strong gale from W. by S. which broke the fine weather; we then had rain and strong winds until the end of the month. Highest state of the thermometer 64°, lowest 38°.—*November.* This month was a more mild month than November generally is in this latitude. Early on the morning of the 6th we had a brilliant aurora, with red tinged clouds in the SW. quarter. The highest state of thermometer 54°, lowest 32°.—*December.* This month was very changeable, yet uncommonly mild for the season. We have had no heavy gales, nor very heavy rains, such as we are generally visited with in this month. The highest state of thermometer 50°, lowest 35°.

Dundee.

XXVIII.

METEOROLOGICAL SUMMARY FOR 1833, AT YORK, WESTERN AUSTRALIA.

BY HENRY OMMANEY, ESQ., F.R.G.S., ASSOCIATE MEMBER.

LATITUDE 31° 53′ S. LONGITUDE 116° 40′ E.

MONTH.	Mean Barometer.	Mean Thermometer.	Wind		Phenomena.		Rain in Inches.	REMARKS.
			A.M.	P.M.	Thunder. Days.	Lightning. Days.		
January.....	29·580	84°·5	S	S	4	3	0·006	During the greater part of the mth. the temp. was much increased, and was rendered oppressive to respiration by the native fires, which from within a mile of the place of observa. to the horizon were burning almost without intermis.
February ...	29·490	81	S	S	0	0	0·250	First part of the month fair, with wind fresh; latter part of the month fresh breezes prevailing from south,—mostly cloudy weather.
March	29·475	71·5	N	SW	5	6	5·465	First 9 days wind moderate during the day and freshening at night, from W and S. Cloudy; this was succeeded by thunder and lightning 4 days; wind fresh throughout the month.
April	29·560	63·5	NW	NW	0	0	0·132	Fair; wind moderate A.M., and freshening at noon and P.M.
May	29·465	58	N	N	1	1	2.589	Light winds prevailed this month; squally on the 8th and 9th; rain 15 days; foggy 30th and 31st.
June	29·250	49	W	N	5	5	7·712	Clear; wind light—occasional gales—foggy on the 17th and 18th.
July	29·420	52·5	S	W	3	2	4·341	,, ,, ,, breezes.
August.....	29·400	52	W	W	6	6	3·109	,, ,, ,,
September...	29·500	59	S	W	3	0	0·281	,, ,, ,, ,,
October	29·480	65·5	W	W	0	0	0·447	,, ,, ,, ,,
November...	29·515	69	S	W	9	10	0.667	Clear; wind light former part of the month; windy at the end of the month, with much thunder and lightning, and but little rain.
December...	29·480	78·5	S	S	6	9	0·393	Clear; wind varying much in strength from A.M. to P.M.—on the whole light.
MEAN.	29·484	65·3	S	W	42	42	25·690	

York Town, in Western Australia, is situated on the left bank of a winter stream, called the Avon. The neighbouring country contains numerous fresh water springs;—the soil is mostly a reddish clay;—the summers are usually droughty;—the wind generally changes its direction at noon, and reaches its maximum strength in the evening.

APPENDIX

TO THE

TRANSACTIONS OF THE METEOROLOGICAL SOCIETY

APPENDIX.

NOTICES OF IMPROVED METEOROLOGICAL INSTRUMENTS BY MR. WOODS.

AN IMPROVED THERMOMETER, SHEWING THE STATE OF TEMPERATURE AT ANY HOUR OF THE NIGHT, WITHOUT THE AID OF ARTIFICIAL LIGHT.

Of all fluids mercury is best adapted for thermometrical instruments: the mercurial thermometer is therefore most generally used. A material objection however to the use of quicksilver is, that its column cannot be so easily discerned, as alcohol tinged with orchil. Observers who are advanced in years, and whose vision is consequently impaired, experience much inconvenience and difficulty in taking thermometrical observations with mercurial thermometers; and the eye of the young observer requires more than a mere glance to ascertain the range of temperature. Those who have long resided in the observatory, and those just admitted within its portals, complain equally of this deficiency in the mercurial thermometer. At night the difficulty increases. The use of artificial light is invariably attended with some inaccuracy in nocturnal observations. Frequently a thermometer may be observed to rise one degree in less than twenty seconds on placing a candle sufficiently near to see its scale distinctly.

To remedy these inconveniences, a narrow streak of white enamel has been introduced into the cane of the thermometer immediately behind the bore which serves as a reflector to the quicksilver within. The figures on the graduated scale being of mother-of-pearl, placed upon a black ground, or upon a piece of ebony, are distinctly visible, and possess many advantages over a metal or ivory scale, in not oxidizing, corroding, &c. A thermometer of this kind may be seen at all hours of the night, without the aid of a lamp or candle, when the moon or stars are visible.

The advantage of this contrivance is, when observing a thermometer at some distance from our place of abode, in avoiding the mortification of having our light extinguished by the wind. It will also be of considerable advantage to the mariner in ascertaining the temperature of the air or sea-water, and may be found useful to the miner, &c. &c.

DOUBLE SELF-REGISTERING THERMOMETER.

The temperature of the atmosphere is a subject of such great importance to the meteorological enquirer, that too much pains cannot be bestowed in tracing out its ever-variable path.

The members of the Meteorological Society will doubtless remember that the first two, and perhaps most important subjects of meteorological research, proposed by the Society for the current session, is "To determine the mean temperature of the several seasons of the year, and also of the whole year at various stations on the surface of the globe;" and "To mark the daily progression of temperature, and ascertain the form of the daily thermometric curves (also at various stations), and from them determine the two periods in each day, at which the mean temperature occurs at each station." Now it will be necessary, rightly to judge of the tables supplied from the various stations, that the instruments be examined as to their accuracy in corresponding with each other, for they will be found to vary according to the nature and time of their construction. This circumstance, mentioned because in the course of a few years some hundreds have passed through the writer's hands, in which a difference has been observed of 1, 2, or 3 degrees. This discrepancy in the instruments would also be found in the tables. Thus, for instance, in comparing a table, furnished by a correspondent at Portsmouth, with another from Glasgow, and supposing the former observer's thermometers had been made six or twelve years, and the latter such as had been made but as many months, we need not be surprised if their tables differ widely from each other, nor even upon an examination and comparison of the instruments, should a difference of two, or even three, degrees be found to exist between them. This discrepancy is occasioned by the quality and age of the glass, the standard by which they are marked off (the scale of which should be graduated on the tube and not attached to it), and the height of the barometer at the time.

Another precaution, which is necessary, is this: in comparing the range of temperature, at different stations, in order to mark the progression, and determine the mean temperature for any given period, we ought first to compare several thermometers together at the same station, as there will be often found a difference of two or more degrees in nearly the same locality, especially on occasions of frequent

and sudden changes of temperature, and during the prevalence of south and south-westerly winds.

To correct in a great measure these discrepancies, the double self-registering thermometer is constructed, consisting of two glass balls, having, connected with each ball, two stems bent at right angles; one is a spirit, and the other a mercurial thermometer; each stem is provided with its own scale, and the tubes placed horizontally on two pieces of boxwood or ivory. The mercurial thermometer is furnished with an index, or piece of steel wire, which is pushed before the mercury in each of the tubes, and marks the maxima of the temperature. In each stem of the spirit thermometer there is a glass index lying in the spirit which is drawn towards the bulb when the fluid is contracted by cold, giving the minima of temperature during the night. It will obviously appear that it is impossible to get thermometers nearer in their locality to each other than by this delicate contrivance; yet even in the two stems has been noticed sometimes a difference of one and one quarter degree, both maxima and minima. In taking the mean of the difference in the two stems, when any occurs, is the only way of obtaining the true amount of temperature in any locality.

IMPROVED BAROMETER.

On the value and importance of the barometer we need scarcely remark: its uses for nautical and surveying purposes, which have long been appreciated, justify the claim of the inventor to some merit. Yet, since the invention of the marine barometer by Dr. Hooke, and from the first application of the mountain barometer in measuring the heights of mountains and the descent of mines and caverns, some objections have greatly limited its use for such purposes; as, for instance, its destruction on exposure to high temperatures—its disarrangement by the motion of a vessel during the vicissitudes of a voyage, or a journey across extensive tracts, or in ascending mountains, all which have caused much annoyance and disappointment to commanders of vessels, and enterprising scientific travellers.

With a view to obviate these objections, an examination of the instruments used, and an investigation of the climates in which those casualties most frequently occurred, may be necessary. The form of the frame into which the tube is generally introduced is such

as to destroy the tube of the barometer,—the latter resting upon the internal surface of the former: the material employed for such frame is commonly *wood*, which in warm climates warps, changes its figure, and sometimes splits asunder, (as occurred to Dr. Smith's in South Africa,) destroying the tube, and with it the utility of the barometer. This destruction of the instrument occurs about the latitude of 40°. On returning to England, a new tube is fitted to it, and on arriving again at the same latitude, a similar accident happens. On discovering this remarkable coincidence, a short paper was drawn up, copies of which were forwarded to his Royal Highness the Duke of Sussex and the Right Honourable the Lords of the Admiralty, pointing out the cause of this circumstance, and the means of its prevention. For it appeared as if the changes which took place in the figures of wood in warm climates must be again reversed, and the wood return nearly to its original state when acted upon by a less degree of temperature. Experience has proved this to be the case, and it is therefore evident that to replace the tube is not to remedy the evil: a source of error will be discovered in the instrument; on each change or reversal of the figure of the wood, an alteration takes place in the adjustment of the barometer scale attached to it. The adoption of metallic frames, it is obvious, would remove the objection.

The liability of instruments of this kind to get out of order by the imperfection of the vacuum, from the presence of air within the tube, may be prevented by introducing an air chamber formed of glass and secured to the lower part of the tube. With this improvement the barometer will act with perfect accuracy, although a portion of air is within this chamber, because the equilibrium of the perpendicular stream of mercury is preserved. This contrivance was suggested by M. Gay Lussac.

The instrument would be perfectly portable, if made after the manner of the improved portable barometers. Before using one of these instruments it must be held in an inverted position, and the cap at the bottom of the cistern forced round, until the words *not portable* are near the *fleur-de-lis*. The oscillation of mercury is thus prevented. If they are made with box-wood cisterns and leathern bottoms, the mercury is not only forced through the pores of the wood on making it portable, but in warm climates the leather becomes hard and the box-wood cracks in all directions.

The marine barometer is a very useful instrument to the mariner. Its indications unheeded may occasion the loss of life and property to all on board. To prevent the "pumping" of the mercury occasioned by the vessel's motion, the tube should possess a remarkably fine bore, about $\frac{1}{48}$th of an inch, and the calibre of the cylinder less than a quarter

of an inch. Marine barometers are generally constructed with the tube and cylinder of dimensions as to occasion them to pump in stormy weather, and to break the tube, or by their constant oscillation, to become of no service to the mariner. Were travellers upon the mighty waters in possession of good instruments, and with such aid would furnish us with the mean height of the barometer and the temperature of the ocean in different latitudes, they would eminently promote the study and science of meteorology, which without extensive co-operation, must necessarily be limited in its sphere of usefulness.

HOURLY METEOROLOGICAL OBSERVATIONS MADE AT THE COLLEGE OF ALOST, AT THE SUMMER SOLSTICE, 1838. BY PROFESSOR STAERCKE.

Hours of Observation.	Barometer.	Thermo.	Hygrom.	Winds.	STATE OF THE WEATHER.
21st June					
6 A.M.	29·617	59°	88°5	SW	Cloudy; between 7 and 8 a little rain.
7	29·699	60	87·3	,,	Cloudy.
8	29·400	63	87	,,	,,
9	29·585	64	85	,,	,,
10	29·580	64·4	85	,,	,,
11	29·581	66·8	80·4	,,	,, between 11 and 12 violent gusts of wind and rain.
12	29·598	64	90·2	,,	,,
1 P.M.	29·627	65	89·7	,,	,,
2	29·636	66·2	85·3	,,	,, between 2 and 3 rain.
3	29·662	65·3	85·7	WSW	,,
4	29·647	67·8	80·4	,,	Clear; between 4 and 5 rain.
5	29·651	66·1	79·3	SW	,,
6	29·655	65·8	76·1	WSW	Calm; cloudy in the horizon.
7	29·686	63	72·4	,,	Cirrus.
8	29·705	59·8	73·5	,,	Clear.
9	29·730	56·8	79·3	,,	,,
10	29·733	58·3	82·9	?	,,
11	29·727	58·1	85·3	?	,,
12	29·718	54·8	89·8	?	,,
22d June					
3 A.M.	29·781	51	91·9	SW	Clear; a little vapour.
4	29·784	51·8	91·9	,,	,,
5	29·899	52·3	91·9	,,	Cloudy.
6	29·829	56	88·7	,,	Cir-strat.
7	29·833	56·8	79·3	,,	,,
8	29·851	58·1	83·2	,,	Cumulus.
9	29·858	59·9	71·2	WSW	,,
10	29·860	63·4	68·1	,,	,,
11	29·863	65·4	66·2	,,	Cir. cum.; between 11 and 12 violent gusts of wind.
12	29·870	64	67·5	,,	Cloudy; between 12 and 1 a little rain.
1 P.M.	29·909	65·6	65·6	,,	,,
2	29·906	65·6	65·1	,,	Clear.
3	29·924	67	64·4	,,	Clouds indeterminate.
4	29·913	65·9	64·7	,,	Some cumuli.
5	29·912	64·8	66·9	,,	,,
6	29·921	63·1	66·7	,,	Cirrus.

Maximum heat . . . . { 21st, 68·5 / 22nd, 69·8

Minimum heat . . . . { 21st, 56·5 / 22nd, 50·5

Rain fallen in the night between 20th and 21st 2 inches

Do. during the 36 hourly observations . . 0·21

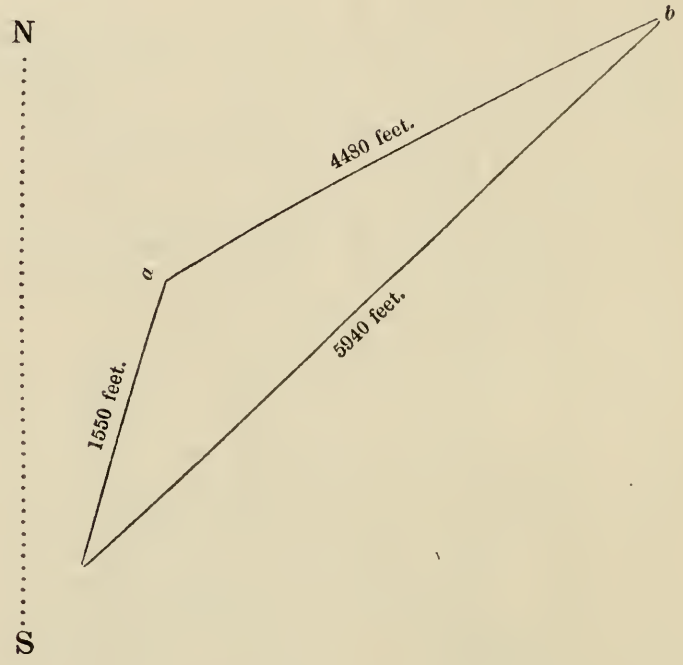
HOURLY METEOROLOGICAL OBSERVATIONS MADE AT THE VERNAL EQUINOX, 1838, AT THE ACADEMY OF SCIENCES, COPENHAGEN. BY PROFESSOR ŒSTED.

1838. March	Barometer.	Thermometer. 8 Feet above the earth.	Thermometer. 116 Feet above the earth.	Direction of Winds.	Direction of Stream.	Appearance of the Heavens.	REMARKS.
21st.							
6 A.M.	—	32°·4	29°	W	S	Cloudy	
7	—	33·3	32·4	,,	,,	,,	
8	—	35·1	31	,,	,,	,,	
9	29·450	36·9	34·1	W	S	Clear	
10	—	38·3	36	,,	,,	,,	
11	—	38·7	36·9	,,	,,	,,	
12	29·508	42·3	38·3	W	S	Cloudy	
1 P.M.	—	43	38·7	,,	,,	,,	
2	—	41·4	38·7	,,	,,	,,	
3	—	41	38·7	W	S	Cloudy	Snow, attended with lightning and thunder, during the space of 10 minutes, between half-past 4 and 5.
4	29·601	38·3	38·7	,,	,,	,,	
5	—	35	36·9	,,	,,	,,	
6	—	33·3	34·1	W	S	Overcast	
7	—	33·3	34·1	,,	,,	,,	
8	—	32·4	33·3	,,	,,	,,	
9	—	30·9	31	W	S	Overcast	
10	—	29·8	32	,,	,,	,,	
11	—	29·8	32	,,	,,	,,	
12	—	29	31·8	S	S	Cloudy	
	—						
22d.	—						
1 A.M.	—	28·8	32	,,	,,	,,	
2	—	31·8	32	,,	,,	,,	
3	—	29·8	32	S	S	Cloudy	
4	—	29	31	,,	,,	,,	
5	—	30	31	,,	,,	,,	
6	—	29·	30·9	S	S	Cloudy	
7	—	30·9	32	,,	,,	,,	
8	—	34·2	33·1	,,	,,	,,	
9	29·730	34·2	34	S	S	Cloudy	
10	—	36	34·4	,,	,,	,,	
11	—	38·3	35·6	,,	,,	,,	
12	29·762	39·2	38·3	S	S	Clear	
1 P.M.	—	37	38·7	,,	,,	,,	
2	—	35	36·5	,,	,,	,,	
3	—	34·6	35·1	SSE	N	Clear	
4	29·802	32·9	32·9	,,	,,	,,	
5	—	31·8	31·8	,,	,,	,,	
6	—	31	31	SSE	N	Overcast	

The height of the barometer above the level of the sea, 12 feet.

The instruments used in these observations are all made by Mr. Purlsen, Polytechnic School, Copenhagen. The barometer is a large one with microscopes, divided after the French scale; the observations need no correction for capillarity or temperature. The thermometers are Reaumur's scale, divided to fifths of a degree; a comparison between them, undertaken a year ago, has shown, that they are in perfect concordance with one another.

The barometer is placed in the Botanic Garden (*a*) the first thermometer near the harbour (*b*), the second on a tower in the city (*c*), both at a distance of one foot from the wall. The situation of these three points to one another will be seen from the following figure.



Lat. 55″ 40′ 43″. Long. 10″ 14′ 54″ E. of Paris.

The clock time is Copenhagen mean time (50° 19′ 9″ E. of Greenwich.)

OBSERVATIONS AT DUNDEE, 20th, 21st, and 22d March.

Week Day.	Therm. Ex.	Barometer.	Sympieso.	Hygro.	WEATHER.	WINDS.
20th 10 P.M.	—	—	—	—	Nimbus; very heavy rains.	Var.
,, 12	53°	29°·21	29°·32	—	,, light rains.	
21st 1·30 A.M.	53	29·21	29·32	—	,, fresh breezes & clear.	West
,, 7	54	29·21	29·38	—	Nascent cumuli; strong winds.	WNW
,, 8	55	29·23	29·40	—	Do. Do.	,,
,, 9	56	29·23	29·42	—	Cumulo-stratus; brisk gales.	,,
,, 10	57	29·23	29·42	—	Blue sky with Do. Do.	,,
,, 11	53	29·26	29·45	—	Do. 10·30. a heavy squall with rain, fresh gales & clear	,,
,, 12	58	29·27	29·43	34	Do. Do.	,,
,, 1 P.M.	60	29·27	29·44	—	Do. with cumuli; strong winds and clear.	West
,, 2	62	29·28	29·44	33	Do. Do; fresh breezes and clear.	,,
,, 3	62	29·28	29·45	—	Do. Do.	,,
,, 4	60	29·29	29·46	—	Do. with comoid cirrus; strong winds with showers.	W by N
,, 5	62	29·29	29·44	—	Do. with cumuli, cirro stratus. Do.	,,
,, 6*	60	29·30	29·46	—	Do. with cum. cirro strat. and nim. in SW. heavy sq. & ra.	,,
,, 7	58	29·30	29·45	28	Blue sky, cirrus & cirro stratus; light breezes & clear.	West
,, 8	56	29·30	29·46	—	Do. with cumuli; moderate breezes and cloudy.	W by S
,, 9	55	29·32	29·52	—	Do. with cumulo stratus; Do.	,,
,, 10	54	..	..	—	,, Do. Do.	,,
,, 11	52	..	..	—	,, Do. Do.	,,
,, 12	53	29·37	29·66	—	,, Do. Do.	West
22d 1 A.M.	53	29·37	29·57	—	,, Fresh breezes and clear.	,,
,, 2	53	29·37	29·57	—	,, Do. Do.	W by S
,, 3	52	..	..	—	,, Do. Do.	,,
,, 4	53	..	..	—	,, Fresh breezes and windy.	,,
,, 5	54	..	..	—	,, Do. Do.	W by N
,, 6	54	29·40	29·60	—	Cumulo stratus. Do.	,,

* At 6·10 a brilliant rainbow, or iris, extending in a SW. and NE. direction, first seen through a thin nimbus; under the arch clear and beautiful; above dense cirro-cumulus; 6 minutes after another iris, above the first one, not so bright as the other cirro-cumulus, betwixt them; the upper one visible only 6 minutes, while the first was seen 43 minutes.

THIRTY-SIX HOURLY METEOROLOGICAL OBSERVATIONS

At the Summer Solstice 1838, made in lat. 53° 14′ N., long. 9° West., 100 yards distant, and 15 yards above high water mark.

BY LIEUT. MORRISON, ROYAL NAVY.

Date and Hour.	TEMPERATURE.—Fahr.						Barometer.	WINDS.		Electrometer deflections.		Depth of Sea.	WEATHER AND OTHER PHENOMENA.
	On Surface in the Sun.	On Surface in Shade.	Five feet above Surface in Shade.	On Surface of the Sea.	At Bottom of the Sea.	Attached to Barometer.		Force.	Direction by Compass.	Plus.	Minus.		
21st 6 AM.	63°	54°	55°	56°	59°·5	58°	29·477	Fresh breeze	W	·10°	...	12 ft.	Fair, cumulo-stratus clouds; an ill-defined Iris NW. has just disappeared.
7	54	54	55	56	57	58·5	29·461	Mod. breeze	NW	·22	...	9	Smart, electrical shower; nimbus clouds east.
8	64	55	57	57	57	59	29·477	,,	WNW	·40	...	6	Shower just passed; fair, clouds prevail.
9	62	56·5	59	56	56·5	60	,,	Strong breeze	W	·55	...	5	Cloudy; light rain at times.
10	84	57	59	58	58·5	60	,,	Fresh breeze	NW	·65	...	6	Fair, cumulo-stratus clouds; raining SE.; *low water* at 9h. 40m.
11	52	52	53	56	58	57·5	29·433	Strong gale	SW	·180	...	6½	Heavy electrical rain, squalls of wind, *thunder;* moon souths 11h. 26m.
Noon	66	58	59	57	57	59·5	,,	Fresh breeze	WSW	·135	...	7	Cloudy, mild air; squalls at times.
1 P.M.	76	58	61	57	58	61·5	29·450	Strong breeze	,,	·165	...	11½	Fair, cumulo-stratus clouds; clear at times.
2	63	59	61	...	58	61	,,	,,	WNW	Not	...	...	Heavy shower, clouds, and squally.
3	...	...	...	...	...	...	Not	...	SW	observ.	...	...	Hard gales, and squally, with very heavy rain and hail. The observations on the sea were prevented by the boat breaking from her anchors. High water 3h. 53m.
4	...	...	...	...	...	...	observed	...	,,	...	...	...	
5	57	57	59	58	59	60·5	29·486	Strong gale	W	·280	...	16	Rain, and strong gales of wind; nimbus and stratus clouds.
6	56	56	58	...	...	61·5	29·513	Strong breeze	,,	·210	...	...	Nimbus and stratus clouds; the storm abating.
7	55	55	57	...	...	61	29·526	,,	W by S	·220	...	...	Cumulo-stratus and nimbus clouds; flying showers.
8	52	52	54	...	...	60	29·550	,,	,,	·260	...	...	The same weather; the sun and moon setting at 8h. 30m.
9	52	51	53	...	...	60	,,	Fresh breeze	,,	·330	...	...	Fairer; cumulo-stratus and cumulus clouds prevail; sun on tropic 9h. 43m.
10	52	51	53	...	...	59	,,	Strong breeze	,,	·380	...	...	Clear overhead, clouds in horizon; Jupiter clearly seen.
11	52	51	53	...	...	60	,,	,,	W by N	·390	...	...	The same weather; stars visible.
12	53	51·5	53	...	...	59·5	,,	,,	WNW	,,	...	...	Overcast, gloomy; the moon on the lower meridian at 11h. 55m.

22d 1 A.M.	52	51	52	...	...	61	,,	,,	W by S	,,	...	...	Cloudy, appearance of rain.
2	53	51·5	53	...	...	61	29·562	Mod. breeze	,,	·360	...	...	Clear; stars visible, storm abated; new moon at 1h. 58m.
3	53	51·5	52·5	...	...	60·5	,,	Strong breeze	WNW	·380	...	...	Clouds, with heavy showers, but mild air; wind increases.
4	53	52	53	...	...	60	29·561	,,	,,	·365	...	...	Cumulus clouds and squalls of wind; high water at 4h. 17m.; sun and moon rise.
5	54	53	53	...	...	60	,,	Strong gale	W	·363	...	...	Dense clouds, and appearance of rain.
6	52	52	53	...	...	59	29·572	Strong breeze	,,	·362	...	...	Cumulus clouds; heavy shower just passed.
7	56	55	57	...	...	59	29·577	,,	WNW	·340	...	...	Cumulus clouds; sudden squalls.
8	58	56	58	...	...	60	29·600	Strong gale	WSW	·340	...	...	Very heavy rain and high wind; thick weather.
9	53	53	56	...	...	60	29·650	,,	WNW	·320	...	...	Heavy rain, squalls of wind; clearing; cumulo-stratus clouds.
10	59	56	59	...	..	61	29·690	Strong breeze	,,	·310	...	...	Cloudy, less wind; low water at 10h. 28m.
11	66	58	60	...	...	61	29·710	,,	,,	·285	...	...	Cumulo-stratus and nimbus clouds; sun shines at times.
Noon	68	59	63	...	...	61	29·763	Strong gale	,,	·315	...	...	Fair; cumulo-stratus clouds; wind increasing with the tide.
1 P.M.	68	59	61	...	...	61·5	29·789	Fresh gale	,,	·325	...	...	Cumulo-stratus and nimbus clouds; sun shines occasionally; less wind.
2	71	60·5	63	...	...	62	29·826	,,	,,	·335	...	...	Cumulus and cumulo-stratus clouds; fairer.
3	57	58·5	59	...	...	61	29·860	,,	W by N	·330	...	...	Cumulus and nimbus clouds.
4	65	59	60	...	...	61·5	29·875	Fresh breeze	,,	·330	...	...	Fair, clear; a few cumuli and cumulo-stratus clouds; less wind.
5	66	59·5	61	...	...	62	29·900	,,	WNW	·330	...	...	Same weather; the gale having abated entirely. High water 4h. 40m.
6	63	57	61	...	...	63	29·922	,,	,,	·310	...	...	Fair, clear; a few cumuli; pleasant evening.

Rain fallen in 36 hours, ·632 of an inch.

N.B. A new moon 72 degrees from Jupiter. Herschel and Jupiter in opposition, and Mercury in Quartile to both.

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Standard Thermometer	Dr. Lee, F.R.S., P.N.S.,&c.
Standard Barometer	The President, George Birkbeck, M.D., F.G.S., &c., 5*l*. R. C. W. 5*l*.

BOOKS.

Annales de l'Observatoire de Bruxelles Aperçu historique sur la Météorologie en Belgique Mémoires sur les Temperatures de la Terre Nouveaux Mémoires de l'Academie de Bruxelles Annuaire de l'Academie pour 1836 et 1837 Bulletins de l'Academie pour 1836 et 1837	Professor Quetelet, Brusselles.
A Treatise on the Causes & Principles of Meteorological Phenomena, Essays on Marsh Fevers, &c., &c. Essays on unexplained Phenomena	Graham Hutchison, Esq., Glasgow.
Esquisse général de l'Afrique Notice des Travaux de la Société des Geographie de Paris pendant l'année 1836 Bulletin de la Société de Geographie, No. 50 Reglemens de la Société de Geographie.	M. D'Avezac, Secretary to the Geographical Society.
Meteorology considered in its connection with Astronomy, Climate, and the geographical distribution of Plants and Animals	Patrick Murphy, Esq.
Description and Results of Observations of a new Anemometer Researches on the Tides, 7th Series	Professor Whewell.
The Cheltenham Annuaire, 1837	Samuel Moss, Esq.
Meteorological Observations, 2 Nos. Atlantic Hurricanes Redfield's Observations on Hurricanes, &c. Transactions of the Albany Institute	From the Albany Institute.

Geological Survey of the State of New York . . Annual Report of the Regents of the University of the State of New York . . . . . . Reports of the Committee appointed to continue the Quarterly Meteorological Observations . Annual Address delivered before the Institute .	From the Albany Institute. *(continued.)*
Essai sur la statisque générale de la Belgique . Catalogue général de l'Etablissement Geographique de Brusselles . . . . . . Dictionnaire des Hommes des Lettres, des Savans et des Artistes de la Belgique	Ph. Vandermaelen, founder of the Geographical Institution, Brusselles.
South African Journal	South African Institute.
Meteorological Almanacs for 1837 and 1838. . A Treatise on Comets . . . . . . Two Nos. of the Cheltenham Gazette . . .	Lieut. Morrison, R.N.
Correspondance pour l'avancement de la Météorologie . . . . . . Memoire sur les Encumbrements des Ports de Mer. Deuxième et la Troisième Memoires sur les Mouvements et les Effets de la Mer . . .	By the Author, M. P. E. Morin, Engineer, &c., Paris.
Sur l'Influence de la Pression Atmospherique sur le Niveau moyen de la Mer	M. D'Aussy, Hydrographer en chef de la Marine, Paris.
Six, on the Construction & Use of Thermometers Sul Modo di ridurre ad unico sistema le Osservazioni Meteorologiche	Capt. W. H. Smyth, R.N., F.R.S., F.R.A.S., &c. &c.
Memoires Courronnés par l'Academie Royale des Sciences et Belles-lettres de Bruxelles . . . Résumé des Observations Météorologiques faites en 1837 a l'Academie Royale de Bruxelles . Rapport sur les Observations des Marées faites en 1835 en Belgique . . . . . . De l'Influence, des Saisons sur la Mortalité aux differens Ages dans la Belgique . . . . . Bulletins de l'Academie Royale de Bruxelles pour 1838 . . . . . . Observations horaires faites au Solstice d'Hiver 1837 de Bruxelles, Louvain et Londres . . . Notice sur les étoiles filantes, par M. Quetelet . Note sur le Magnétisme Terrestre . . . . Note sur l'Entensité du Froid au mois de Janvier, 1838, par M. Quetelet . . . . . . Annuaire de l'Academie Royale de Bruxelles . ,, ,, Observatoire de Bruxelles . . .	M. Crayhay, Professor of Physics at the University, Louvain.

Observations of the Meteoric Shower of November 1837, in America	Professor Olmsted, Yale College, U. S.
Observations Météorologique et magnétique faites dans l'étendue de l'Empire de Russie . . .	M. A. T. Küpffer, Professor of Meteorology at the Academy of Sciences, St. Petersburgh.
The American Journal of Science and Arts. No. 70 and 71	Professor Silliman, New Haven.
Four Discourses delivered before the Royal Academy of Sciences, Lisbon	Le Conseiller de Macedo, Secretary to the Royal Academy of Sciences Lisbon.
Lo Studio 4 Nos.	
Hurricanes and Storms of the Atlantic . . .	W. C. Redfield, Esq.
Nautical Magazine, January, 1839	

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INSTITUTED IN THE YEAR MDCCCXXIII.

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1. The Meteorological Society is instituted for the cultivation and advancement of Meteorology.

2. The Society shall consist of three classes:—

1st. Members, or those persons residing in the British Islands already elected, and to be elected as hereinafter mentioned.

2nd. Associates, or those persons co-operating with the Society, but residing out of the British Islands.

3rd. Honorary Members.

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1. Every person desirous of becoming a Member or Associate of this Society, shall be proposed and recommended by three Members or Associates, one of whom shall certify his personal knowledge of the Candidate.

2. Every person proposed for admission as an Honorary Member, shall be recommended by three Members or Associates, all of whom shall certify that he is eminent in science, and that they have a personal knowledge of him, or are acquainted with his scientific works.

3. Every recommendation for admission shall be delivered to either of the Secretaries, and be read at two successive Ordinary Meetings; after which a ballot shall be taken, and a majority of votes shall decide.

4. If it shall appear that the person proposed is not elected, the result shall not be entered on the minutes; but he cannot be again proposed during one year.

Section III.

Election of Officers and Council.

1. The Officers of the Society shall be chosen from amongst the Members, and shall consist of a President, Two Vice-Presidents, a Treasurer, Two Secretaries, and a Foreign Secretary, who with Twelve other Members, shall constitute a Council for the management and direction of the affairs of the Society.

2. The President, Vice-President, Treasurer, Secretaries, and Twelve

other Members of the Council, shall be annually elected by ballot, subject to the control of the General Meeting.

Section IV.

Annual Contributions.

1. Every Member shall contribute One Guinea annually, and shall pay his first Annual Contribution within two calendar months, otherwise his election shall be void. But after the Annual Meeting in March 1839, every Member on his election shall pay an entrance fee of One Guinea in addition to his Annual Subscription. The Council shall have power to extend the period within which, in particular cases, such first Annual Contribution may be paid.

2. Any Member subscribing Ten Guineas, in addition to his entrance fee, shall be considered a Life Member.

3. Annual contributions shall become due at the General Meeting in the month of March, and no Member shall have a vote in the Society whose Annual Contribution is three months in arrear.

4. If any Member shall neglect paying his Annual Contribution for the space of one year, he shall, at the end of three months, after official written notice has been given him thereof without effect, be no longer a Member.

5. Every Member shall be liable to the payment of the Annual Contribution until he has either forfeited his claim, or signified in writing to the Society his desire to resign; when his name shall be erased from the list of Members.

Section V.

President and Vice-Presidents.

1. The duty of the President shall be to take the chair at the Meetings; to regulate and keep order in all the proceedings of the Society; to state and put questions; and to carry into effect the Regulations of the Society.

2. In the absence of the President, one of the Vice-Presidents shall take the Chair, or in their absence, the Treasurer, or one of the Council, and conduct the business of the Meeting.

Section VI.

Treasurer.

1. The Treasurer shall receive money due on account of, and for the use of the Society, and shall pay all debts due by the Society. He

shall also keep an account of such receipts and payments in the manner approved by the Council.

2. No payment exceeding £5 shall be made by the Treasurer, except by order of the Council: one of whom, with the Chairman, must sign the order.

3. The accounts of the Treasurer shall be audited annually, by three Members appointed at the preceding Annual General Meeting, who shall report, at the next Annual Meeting, the state of the funds of the Society.

Section VII.

Duties of the Secretaries.

1. The duty of the Secretaries shall be to attend all Meetings of the Society and of the Council; to take minutes of their proceedings, and enter them in books provided for that purpose; and shall read all papers laid before the Society.

2. The Secretaries shall conduct the Correspondence of the Society and of the Council.

3. All papers intended for the use of the Society, shall be delivered to the Secretaries, who shall lay them before the Council.

4. The Secretaries shall have the charge, under the direction of the Council, of printing and publishing the Transactions and other papers of the Society.

Section VIII.

Council.

1. The Council shall meet, at least, once in every month during the Session; but any three Members of the Council may, by letter to either of the Secretaries, require a Special Meeting to be called in the intervening period.

2. Three Members shall constitute a quorum.

3. Due notice of the Meetings of the Council shall be sent by one of the Secretaries to every Member thereof.

4. All questions shall be decided in the Council by vote, unless a ballot be demanded. Should two members present be desirous of postponing the decision upon any question then first proposed, such decision shall be deferred accordingly, until the succeeding Meeting.

5. The Council shall prepare a Report on the proceedings of the Society, to be presented at the Annual General Meeting.

Section IX.

Ordinary Meetings.

1. The Ordinary Meetings of the Society shall be held on the second Tuesday in every month, from November to June, both inclusive.

2. *Five* Members shall constitute a quorum.

3. Business shall commence at Eight o'Clock in the Evening precisely, when the Minutes of the preceding Meeting shall be read, and the minutes of the Council shall be laid on the table, to be read if required.

4. The business of the Ordinary Meetings shall be to propose and ballot for Candidates, to announce Donations; to read such Communications relating to Meteorology, and subjects connected therewith, as may have been presented; and to proceed upon such matters as shall have been referred to them by the Council.

5. Every Member may introduce a visitor at the Ordinary Meetings, on writing the name of such Visitor in a book provided for that purpose.

6. Nothing relating to the Laws or Management of the Society shall be brought forward at any of the Ordinary Meetings.

Section X.

Annual General Meeting.

1. A General Meeting of the Society shall be holden Annually on the *Second Tuesday* in March, at such place as shall be determined by the Council, to receive and consider the report of the Council on the affairs of the Society, to elect Officers for the ensuing year, and to discuss and determine all such questions as shall be referred to them by the Council, relating to the enactment of new, and the alteration or repeal of existing regulations.

Section XI.

Special General Meetings.

1. The Council may at any time call a Special General Meeting of the Society, when it seems to them to be necessary.

2. A week's notice shall be given to every Member of the time of such Meeting, and of the business for which it is summoned, and no other business shall be brought forward at such Meeting.

Section XII.

Of making New, and Altering and Repealing Existing Regulations.

1. Whenever the Council may think it advisable to recommend the enactment of any new Law or Regulation, or the alteration or repeal of any existing Law or Regulation, they shall propose the same to the Society at the Annual General Meeting next ensuing, or at a Special General Meeting convened for that purpose.

2. Five Members, who are not of the Council, may recommend any new Law or Regulation, or the alteration or repeal of any existing Law or Regulation, to the Council, by a letter directed to one of the Secretaries. On the recommendation thus transmitted to them, the Council shall decide at their next Meeting; and if such decision be not satisfactory to the Members proposing the measure, the Council shall, if required by any other five Members bring forward the same for the opinion of the Society at large, at a Meeting specially convened for that purpose.

Section XIII.

Scientific Committees.

1. Committees for forwarding specific objects connected with meteorology, may, from time to time, be appointed out of the body at large by the Council, to whom their reports shall be submitted, which, if approved, shall be presented to the Society at an Ordinary Meeting.

Section XIV.

Papers for Publication.

1. Such Papers as have been read before the Society, shall be referred to the Council for their consideration; and no paper shall be published unless two-thirds of the Council vote in its favour.

2. No Paper delivered to the Society shall be altered, without the consent of the Author and the Council; nor shall any Paper intended for publication, be withdrawn from the possession of the Society.

Section XV.

Property of the Society.

1. The whole of the Property belonging to the Society shall be invested in the names of three Trustees, one of whom shall be the Treasurer for the time being.

2. On the death, resignation, or removal beyond ten miles from London, of any Trustee, the Society shall, at the next General Meeting, elect a person to fill up the vacancy.

Section XVI.

Donations.

1. Donations of Books, Instruments, or other Property shall be specially recorded in the minutes; and the record shall be inserted, with the name of the Donor, in the next Volume of the Society's Transactions.

Recommendations.

1. Every person derious of bequeathing to the Society any Money, Stock, Manuscripts, Books, instruments, or other personal property, is requested to make use of the following form in his or her Will, viz.—

> "I GIVE to the Trustees for the time being of the Society "formed in London, under the name of the Meteorological "Society, for the use of such Society,
>
> [*Here specify the sum of Money, Stock, or other personal property intended to be given.*]
>
> "and I direct that the same shall be delivered within Six "Months after my decease. And I hereby declare that the "receipt of such Trustees shall be an effectual discharge to my "Executors for the said Legacy."

2. Every person desirous of giving to the Society, any Land, Houses, or other real property, for the general purposes of the Society, is requested to take notice that any devise of real property to the Society would be void at Law under Mortmain Act, and that the proper mode of proceeding, in such a case, is to convey the Land, Houses, or other real property to the Society by Deed, which Deed to be effective, must be executed in the presence of two or more witnesses twelve months before the death of the Donor, and inrolled in the Court of Chancery within six months after its execution.

It may be proper also to add for the information of every person desirous of conveying to the Society any Land or other Real Property, or any interest connected with Land, or Money to be laid out in Land, or in the proceeds of the Sale of Land, that it is desirable that he should not proceed to carry his intention into execution, without first consulting some professional person.

Communications, Donations of Books, Instruments, &c., may be forwarded to any of the Members of the Council, or to either of the Secretaries, free of expense, at Mr. R. C. Woods, No. 47, Hatton Garden, London.

STEWART AND MURRAY, PRINTERS, OLD BAILEY.

1838.

BY ORDER OF THE PRESIDENT AND COUNCIL OF THE
METEOROLOGICAL SOCIETY.

OBSERVATIONS made at London for 37 successive Hours, commencing at 6 A.M. of the 21st March, and ending 6 P.M. of the 22nd. London Clock Time.

LATITUDE 51° 30′ 48″ N. LONGITUDE 0° 5′ 46″ W.

Day.	Hour.	Barometer.	Thermometers. Mean Att.	Ex.	Solar Rad.	Dew points.	Electrometer. + or East.	− or West.	Wind. Direct.'	Stren.	Clouds. Character.	From	To	Rain. in inches.	Evap. in inches.	REMARKS.
21	6 A.M.	29·150	51°7	36°5	..	36°	5°	..	SW	6	..	..	..	..	..	Fair, blue sky; sun rose majestically.
	7	29·158	51 7	37 3	..	34	7	..	SW	6	..	..	..	..	..	,, ,,
	8	29·158	51 5	39 6	0 5	38	3	..	SW	8	Scat. cum.	WSW	E	..	..	,, Mist 40 degrees from the earth,
	9	29·150	51 3	42 7	1 0	43	0	0	SW by W	9	Cumuli	W	E	..	..	,, Fleecy clouds in the neighbourhood of, and passing over the ⊙
	10	29·158	51 5	43 5	9 5	43	3	..	W	8	,,	,,	ENE	..	..	,, Clouds in neigh. of ⊙ assume a cum. form, and occasionally obscure him. 10h. 57m overcast.
	11	29·158	51 7	46 3	16 7	44	0	0	WSW	10	,,	WSW	E	..	..	,, Cum. and distort. fleece clouds cover half the sky.
	12	29·178	52	46 6	18 9	44	0	0	WSW	10	Fleecy	W	E	..	..	,, Blue sky nearly unbroken; small cumuli clouds forming on and around the sun.
	1 P.M.	29·148	51 7	48 1	6 4	46	..	5°	,,	10	Cumuli	,,	,,	..	..	,, Clouds inc. cover the ⊙ and appear threatening.
	2	29·130	52	48	glea.	46	..	2	W	9	Nim.cum.	,,	,,	..	..	,, Neighbourhood of ⊙ more threatening.
	3	29·118	52	47 8	obs.	47	..	1	,,	11	Nimbus	,,	,,	..	..	Overcast; dense clouds and lowering in the W.; clouds rising in the E.; storm approaching, came in 12m.; hailed from 5m.
	4	29·128	52 5	45 5	glea.	44	7	..	,,	8	Fleecy	,,	,,	0.015	..	Clear in the Zenith; fleece clouds in the W., fawn do. in the E.
	5	29·126	52 5	44 9	,,	44	8	..	,,	5	Undefined	,,	,,	..	..	,, ,, clouds gathering.
	6	29·134	52	42 6	sett.	42	20	..	,,	5	,,	,,	,,	..	..	,, Blue sky, clouds dispersed.
	7	29·142	52	41 1	..	42	22	..	,,	4	,,	,,	,,	..	..	,, ,, Stars of the first magnitude visible.
	8	29·142	52 5	40 5	..	38	..	..	,,	2	..	..	..	..	..	Overcast; stars obscured.
	9	29·158	52 2	40 2	..	37	5	..	,,	1	Cloudless	..	..	..	..	Fair; no stars visible.
	10	29·166	52 2	40 1	..	36	5	..	,,	0	..	..	..	..	..	,, ,,
	11	29·174	52 5	39 5	..	35	15	..	SSW	0	..	..	..	..	..	Clear in the Zenith; clouds forming in the neighbourhood of Jupiter obscure him; 10h. 4m. clouds from SW.
	12	29·190	52 5	38 6	..	35	15	..	SW	1	,,	..	..	..	0.25	,, Stars of the fifth magnitude visible; Jupiter shines brilliantly.

22	1 A.M.	29·200	51	3	36	9	..	34	10	..	,,	1	,,	..	..	..	..	,, Stars of the 6th magnitude visible.
	2	29·200	52		35	8	..	33	..	..	,,	1	,,	..	..	..	..	,, ,,
	3	29·200	51	5	35	4	..	33	0	0	W	1	Cumuli	W	E	..	..	,, ,,
	4	29·198	51	5	36	1	..	36	0	0	,,	1	..	..	..	..	..	Overcast; heavens overspread with clouds.
	5	29·200	51	5	36	4	..	35	0	0	,,	1	..	..	..	..	..	,, Day-light appears; fall of light snow.
	6	29·218	51	5	36	9	..	35	..	2	WNW	1	..	NW	SE	..	..	,, Cloudy; dew falling.
	7	29·232	51	7	37	6	..	35	0	0	,,	2	..	,,	,,	..	..	,, ,, Wind appears inclined to veer to NE.
	8	29·250	51		38	5	..	36	0	0	,,	2	..	N	SE	..	..	,, ,, Mist falling; air much unsettled.
	9	29·258	51		39	6	..	39	..	9	NNE	2	..	,,	,,	..	..	,, ,, ,,
	10	29·274	51		41	2	glea.	41	..	9	NE	2	..	NE	SW	..	..	,, ⊙ obscured by dark vapour clouds.
	11	29·292	51	3	41	3	obs.	43	..	10	,,	4	..	,,	,,	..	..	Completely overcast; sky threatens a gale.
	12	29·300	51	5	40	6	,,	40	..	8	,,	3	..	N	S	..	..	,, ,, dark vapour clouds cover the Zenith.
	1 P. M.	29·300	51	3	39	9	,,	39	..	8	,,	3	Undefined	,,	,,	..	..	Rain; thick haze.
	2	29·308	52		40		,,	39	5	..	,,	3	,,	,,	,,	..	..	,, ,,
	3	29·318	52		40	4	,,	40	5	..	,,	3	,,	NE	SSW	..	..	Overcast; thick haze.
	4	29·324	51	5	40		,,	40	3	..	,,	3	,,	,,	,,	..	..	,, ,,
	5	29·350	51	5	39	9	,,	39	0	0	,,	5	Nimbus	,,	,,	..	..	Blue sky in Zenith; scattered clouds passing over and discharging their aqueous contents.
	6	29·358	51		38	9	,,	38	+	—	N	6	Undefined	N	S	0·005	0·20	Overcast; clouds passing rapidly to the S.
MEAN ..		29·206	52	2	40·4	8·76		39	8·6	6	W	4·5				0·020	0·45	

BAROMETER.

Maximum on the 21st at 12 P.M. .	29·190	Mean 29·274	Minimum on the 21st at 3 P.M. . .	29·118	Mean 29·158
Maximum on the 22nd at 6 P.M. . .	29·358		Minimum on the 22nd at 4 A.M. . .	29·198	

THERMOMETERS.

Max. hourly readings on the 21st . .	52° 5	Mean 52° 25	Min. hourly readings on the 21st . .	36° 5	Mean 35° 95
Max. hourly readings on the 22nd . .	52 0		Min. hourly readings on the 22nd . .	35 4	

SELF-REGISTERING.

MAXIMUM OF THE 21ST.		MINIMUM OF THE 21ST.		MAXIMUM OF THE 22ND.		MINIMUM OF THE 22ND.	
On the Earth . .	48° 2	On the Earth . .	34° 5	On the Earth . .	42° 5	On the Earth . .	32° 5
4 feet above ditto .	50 0	4 feet above ditto .	35 0	4 feet above ditto .	49 0	4 feet above ditto .	35 0
30 feet above ditto .	53 0	30 feet above ditto .	33 0	30 feet above ditto .	46 0	30 feet above ditto .	34 0

1838.

BY ORDER OF THE PRESIDENT AND COUNCIL OF THE METEOROLOGICAL SOCIETY.

OBSERVATIONS made at London for 25 successive Hours, commencing at 6 A.M. of the 21st June, and ending 6 A.M. of the 22nd. London Clock Time.

LATITUDE 51° 30′ 48″ N. LONGITUDE 0° 5′ 46″ W.

Day.	Hour.	Barometer. In.	Barometer. Dec.	Thermometers. Dif. Wet & Dry Bulb.	Thermometers. Ex.	Thermometers. Solar Rad.	Dew points.	Wind. Direct.	Wind. Stren.	Clouds. Character.	Clouds. From	Clouds. To	Rain. in inches.	Evap. in inches.	REMARKS.
21	6 A.M.	29.690		1° 2	59°	—	58°	WSW	5	Nim.	WSW	ENE	—	—	Very light rain, sky clear in the E, horiz. wind gusty. From midnight it has been windy, with a falling barometer and gentle rain.
	7	29.674		1 8	59 9	—	60	WSW	7	,,	SW	NE	—	—	Sky threatening, vapour clouds much agitated, varying SW; NE and W; E; 40m. completely overcast.
	8	29.688		1 4	59 7	—	60	W	5	,,	WSW	E	—	—	Light rain, clouds disper. in SW, dense mist in N; 30m. clouds disper. in zen. 45m. upper strata of clouds from E.
	9	29.722		3	60	—	61	W	5	Stratus	Upp. NE Low. W	SW E	0.015	0.10	Sky clearing; cum. ris. in E. wind var.; 38m. sun shone through clouds, 40 minutes 30 seconds obsc.; 45m. min. clouds lowering, patches of blue sky in the N.
	10	29.762		4	61 4	1° 5	61	W	7	Bro. Nim.	W	E	—	—	Broken vap. clouds passing over and discharge a few drops, lines of vap. N and S; 19m. sun en Cancer; cloudly; 47m. cum in NE, sun gleamy, upp. clouds move fr. E, middle fr. S, and lower fr. W.
	11	29.790		5	63 5	4	62	NNW	6	Cum. stra.	NNW	E	—	—	Neigh. of sun threat. blue sky N studded with fleece clouds; 17m. blue sky in zen. overcast in N; 46m. over in zen. sun obscured.
	12	29.800		5 5	63 9	7	63	W	5	,,	W	E	—	—	Cloudy, blue sky in zen.; 30m. clear, Sol. radi. 14 degrees, exter. ther. 66 degrees.
	1 P.M.	29.800		8 1	67 6	13 5	67	NNW	5	,,	NNW	ESE	—	0.05	Blue sky in zen., cum. in N; 21m. high water, London; wind gusty; 50m. sun obscured by cumulus clouds.
	2	29.802		7 2	67 5	glea.	65	WSW	4	Cumuli	WSW	ENE	—	—	Cumuli cover half the sky; they lower, affect the temp.; 26m. sun obscured by a large cloud heavily charged with electric rain; 40m. light rain.
	3	29.824		4 7	63 2	,,	63	W	4	Nim.	W	E	—	0.05	Overcast; light rain; 30m. blue sky in zenith.
	4	29.838		5	64 3	,,	64	W	5	—	—	—	0.005	—	Clear blue sky, little glare N; 6m. sky covered with glare excepting in the SE.
	5	29.838		6 5	65 4	,,	64	WNW	6	Glare	WNW	ESE	—	—	Fair, much glare N and S.
	6	29.850		5 9	63 4	,,	62	WSW	4	Cumuli	SW	NE	—	—	Blue sky, broken by light cumuli; 35m. clouds lowering.
	7	29.862		3 8	61	obs.	58	W	3	,,	W	E	—	0.03	,, ,, and light cum., sun obscure; 40m. clouds incr. cover the sky, sun appro. horizon, exhibit prismatic display, wind gusty.
	8	29.878		3 7	59 5	,,	59	W	4	Stratus	W	E	—	—	Overcast, dense vapour clouds near W horizon; 18m. sun set; 22m. vapour clouds in zenith, light deposition.
	9	29.890		3	58	set.	56	W	4	—	SW	NE	—	—	Clear blue sky, two bands of glare extending from SW to NE; 50min. ursa major vis.; 53m. ursa minor vis.
	10	29.900		2 5	56 8	—	55	W	5	Vapour	W	E	—	—	Clear in the zenith, stars of 2 mag. visible; 18m. Jupiter obscured; 25m. stars totally obscured; 30m. stars 3 mag. vis. by telescope; N cloudy.
	11	29.900		2 5	56	—	54	W	6	—	—	—	—	—	Clear and cloudless; stars 4th mag. vis. 17m. cloudy N and S; 30m. light clouds from W to E, through which the stars are visible.
	12	29.910		2	55	—	55	W	6	—	WSW	ENE	—	—	Clouds in zenith, Jupiter obscured by ditto, dense clouds N; 35m. cloudless over the whole heavens, stars brilliant; 51m. high water, light clouds move from NW to SE.
22	1 A.M.	29.928		1 9	54 4	—	54	W	3	—	—	—	—	—	Clear blue sky, stars 6th mag. visible.
	2	29.938		1 5	53 5	—	52	W	2	—	—	—	—	—	Blue sky unbroken; 34m. new moon, clear; Mercury and Venus shone brilliantly.
	3	29.948		1 3	53 2	—	51	W	3	—	—	—	—	—	,, ,, ,, wind gusty; 45m. sun rising.
	4	29.948		1 5	53 3	—	52	W	4	—	—	—	—	0.02	Blue sky; a light cloud passing from W to E; 18m. cumuli passing rapidly to the E.
	5	29.950		1 3	54	glea.	52	SW	4	Nim.	SW	—	—	—	Clear blue sky; 30m. cloudy; 40m. nimbus passing rapidly to NE, and obscure sun.
	6	29 950		1 7	57 6	5	55	SW	4	Cumuli	SW	—	—	—	Fair, sun dispelling clouds; 54m. sky covered with glare.
MEAN..		29.843		3 44	59.64	6. 2	58.52		4.64				0.020	0.25	

OBSERVATIONS made at LONDON for 25 successive HOURS commencing at 6 A.M. of the 21st SEPTEMBER, and ending 6 A.M. on the 22nd. London Clock Time.

LATITUDE 51° 30′ 48″ N. LONGITUDE 0° 5′ 46″ W.

Day.	Hour.	Barometer. Inc.	Barometer. Dec.	Thermometers. Ex.	Thermometers. Dif. Wet & Dry Bulb.	Thermometers. Solar Rad.	Dew points.	Wind. Direction.	Wind. Stren.	Clouds. Character.	Clouds. From	Clouds. To	Rain in inches	Evap. in Inches.	REMARKS.

Range of the Barometer on the 21st 0·091 inch. Range of the Barometer on the 22nd 0·030 inch. Whole Range 0·121 inch.

THERMOMETER.

Max. hourly readings on the 21st at 2 P.M. 61·7
Min. hourly readings on the 21st at 7 A.M. 45·5
} Mean 53·6

Max. hourly readings on the 22d at 1 A.M. 48·6
Min. hourly readings on the 22d at 6 A.M. 43·8
} Mean 46·2

Range of Thermometer on the 21st 16·2 Range of Thermometer on the 22nd 4·6 Whole Range 20·8

SELF-REGISTERING THERMOMETER.

MAXIMA ON THE 21ST.

On the Earth	60·0	Mean 61·63
4 feet above ditto	60·9	
30 feet above ditto	64·0	

MINIMA ON THE 21ST.

On the Earth	39·8	Mean 41·76
4 feet above ditto	45·5	
30 feet above ditto	40·0	

Range of Min. and Max. on the earth, 21·8. 4 feet above the earth, 15·4. 30 feet above the earth, 24·0

Max. dew point, Daniell's hygrometer	51°	Mean 48°
Min. dew point	45	

MAXIMA ON THE 22ND.

On the Earth	58·0	Mean 60·43
4 feet above ditto	60·0	
30 feet above ditto	63·3	

MINIMA ON THE 22ND.

On the Earth	40·0	Mean 40·00
4 feet above ditto	42·0	
30 feet above ditto	38·0	

Range of Min. and Max. on the earth, 18·0. 4 feet above the earth, 18·0. 30 feet above the earth, 25·3.

Max. dew point, Daniell's hygrometer	47°	Mean 45°
Min. dew point	43	

OBSERVATIONS made at LONDON for 25 successive HOURS commencing at 6 A.M. of the 21st SEPTEMBER, and ending 6 A.M. on the 22nd. London Clock Time.

LATITUDE 51° 30′ 48″ N. LONGITUDE 0° 5′ 46″ W.

Day.	Hour.	Barometer. Inc.	Barometer. Dec.	Thermometers. Ex.	Thermometers. Dif. Wet & Dry Bulb.	Thermometers. Solar Rad.	Dew points.	Wind. Direction.	Wind. Stren.	Clouds. Character.	Clouds. From	Clouds. To	Rain in Inches	Evap. in Inches.	REMARKS.
21	6 A.M.	29·935		45°·8	1°·5	..	45°	WSW	0	Cirrus Cirrostratus	W	E	..	..	The night has been calm and clear; at 5 A.M. a magnificent blue sky, uninterrupted by cloud or vapour; at 6 A.M. cirrostratus began to form in the N., and faint lofty cir. in the zenith, stretching N. & S.; blue sky W., haze N., dew falling; 40m. overcast in N.; cirstra. still appears in N.; sun attempts in vain to appear through the mist, and the intercepting clouds are slightly tinged by his rays; 50m. clouds have covered the whole heavens, much overcast.
	7	29·945		45·5	0·5	..	45	NNW	0	Cloudless	W	E	..	..	Slightly overcast in zenith; much overcast and dark in N., probably increased by perspective: 20m. a few light cumulus clouds in S., still overcast; 48m. all appearance of clouds have vanished, and the quantity of atmospheric vapour resembles a fog; 50m. darkness increases, and the air moves from all points of the compass.
	8	29·945		46·7	0·3	..	46	Calm	0	,,	..	..	..	..	Universal gloom veils the face of nature, and all surrounding objects are covered with dew; 30m. sun shone, but the rays soon intercepted by a fog; 45m. fog increasing, obscuring objects at the distance of 100 feet.
	9	29·944		47·6	0·7	..	46	ENE	0	,,	..	..	..	..	Fog disappearing; sun appears through the vapour, and dispelling the fog; 30m. clearing in the S., and a faint solar halo visible; 45m. halo disappeared, and the sun shines majestically, rapidly dispelling the etherial vapour.
	10	29·944		51·5	1·3	9°·0	49	NNW	0	Cumulus	W	E	..	..	Clearing in the zenith; blue sky W.; haze E, sun shining; 5 min. cumulus in zenith, 17m. large cumulus, clouds in N. sol. rad. 13 deg.; 36m. clear in zenith, cloudy N. & W; 55m. sun obscured by large cumulus clouds.
	11	29·950		57·0	5·0	15·0	48	NNW	0	Cumulus Stratus	NNW W	ESE E	..	..	Cloudy N. & W., glare in the zenith; 15m. sun obscured by cumulus, and glare; 30m. cumulus, heavily charged, passed over the sun and obscured him until 48m; cloudy in zenith; mist to the E.; 48m. light air moving from W.; overcast E. & SE.
	12	29·950		59·3	5·4	13·2	50	W	0	Cumulus Glare	W	E	..	0·28	Cloudy in the E. & SE.; blue sky and glare in zenith and W.; 27m. dense cumulus clouds N. & S.; sun obscure; clouds lowering in the NE.; blue sky in zenith; 32m. threatening in the NE., upper clouds from W., lower ENE., fresh air commencing from NNE.; 50m. sun again appeared from behind the clouds.
	1 P.M.	29·940		59·0	5·5	21·0	49	NE by N	2	Cumulus	NNE	SE	..	..	Clear blue sky in zenith, overcast N., threatening NE., cloudy W., S., & SE., wind varying from SE. by N. to NNW.; 38m. clouds from N. sol. rad. 24 deg.; difference wet and dry bulb 6 deg.
	2	29·942		61·7	8·2	13·0	47	NNE	1	Glare Cumulus	N	S	..	..	Sky covered with glare; 25m. clear blue sky in zenith, cumulus south; sol. radiation 17 deg. 3m.; 43m. cumulus in the NE.; 48m. cumulus increase, and extend from N. to E.; 54m. cumulus extend from N. to S.
	3	29·942		60·7	7·8	glea.	48	NNW	2	Cumulus	WNW	ESE	..	..	Clear in zenith; eastern horizon covered with cumulus; overcast in NW.; 40m. many large cum. clouds S. & NW. passing over the sun, and occasionally obscuring him from view.
	4	29·938		58·3	5·8	,,	51	WNW	1	Cumulus Glare	WNW	ESE	..	..	Clear blue sky in the zenith, glare and cumulus in the horizon, alternatively passing over the sun 11 min. clear blue sky N. & E.; cloudy S. & W.; 45m. faint cir. cumulus in the NE.
	5	29·955		57·3	4·8	..	48	WNW	1	Cirrostratus Cumulus	N	S	..	..	The sky is covered in the zenith, S & SE. with glare; cumulus in NE., cirrostratus in NW.; 27m. entire blue sky, excepting W. & SW.
	6	29·965		56·5	5·2	..	46	NE	1	Blue sky Cloudless	..	..	..	0·10	Sun below the horizon, and his faint shooting rays intercepted by very light patches of d storted cumulus, causing them to appear of a bright red and orange colour, and present on the dark azure sky a pleasing scene to the observer; 45m. Polaris visible.
	7	29·996		53·6	3·3	..	45	NNE	2	..	..	..	..	..	Clear blue sky; stars of the first mag. vis.; 15m. stars of the 2nd mag. vis., 3d do. faintly vis.; 22m. an auroral shoot in the N.E.; 30m. low band of cirrus stretching N. & S., through which the stars are visible; 40m. light fleece clouds cover the sky, but stars of the first mag. are visible.
	8	30·010		53·6	3·1	..	47	NNW	1	..	W	E	..	..	The sky is overspread with thick vapour clouds, excepting a few patches of blue sky, where stars are visible; 22m. a solitary star in the south is visible; 40m. stars of 2nd mag. visible; light clouds encircling Polaris; clouds in the N.E. and S.W.
	9	30·015		52·0	2·0	..	48	Calm	..	Light vapour passing	NW	SE	..	..	Serene; stars shine brilliantly; light clouds are scattered over the western horizon, but not obscuring stars of the 3rd mag.; 3m a meteor shot from the south, and took a north-easterly direction; 35m. eastern horizon entirely overcast.
	10	30·015		51·3	2·5	..	49	,,	..	Clear sky	..	..	..	..	Sky unintercepted by clouds, and the stars shine brilliantly; all is perfectly calm. Pleiades shine most splendidly; 5m. a small meteor without train shot below Ursa Major, and took a north-easterly direction.
	11	30·026		50·0	1·7	..	48	,,	..	,,	..	..	..	..	Stars shine with great brilliancy, without a single cloud from the Zenith to the horizon; 35m. a very light air moving from N.N.W.
	12	30·026		49·0	0·7	..	48	,,	..	,,	..	..	..	0·20	Sky universally bright, and the stars shine with majestic splendour; but all traces of meteors are gone.
22	1 A.M.	30·030		48·6	1·2	..	47	,,	..	,,	..	..	..	..	Sky still bright and clear, and stars of the 5th magnitude are visible.
	2	30·035		48·3	1·0	..	46	,,	..	,,	..	..	..	..	Sky continues as before; 45m. mist rising in the north-east.
	3	30·043		47·3	1·0	..	45	,,	..	,,	..	..	..	..	The heavens appear like a southern sky, and the stars shine forth, richly bespangling the firmament with the brilliancy of their unbortowed light, and declare the grand, the beautiful, the handy-work of God; 20m. slightly overcast in the Zenith.
	4	30·046		46·2	0·7	..	46	,,	..	,,	..	..	..	..	Serene, heavy dew falling; not a breath of air is passing; 35m. day-breaking, the planet Venus rising in the east, and shining beautifully.
	5	30·050		45·0	1·7	..	44	N	0	Cumulus	N	S	..	..	Clear blue sky, light cumulus clouds passing from north to south; Venus still shining in the S.E.; 40m calm and beautiful blue sky; the lower current of air moving from S.S.W.
	6	30·060		43·8	0·8	..	43	SSW	0	Cirrostra.	N	S	..	0·10	Serene; 15m. sun rising and clouds forming in the east; 30m. lofty cirro-stratus N. & S.; 7h. 20m. fog from the north-east; 10h. the fog disappeared, and the sun shone throughout the day; from 3 to 4 P.M. there appeared every modification of clouds; and the wind blew a light air. On the 23rd we had a few light showers, and a fresh breeze of wind from the south-west.
MEAN . .		29·986		51·83	2·86	14·24	46·06	NNW	1·3 nearly	Cumulus	W	E	..	0·68	Mean Barometer corrected 29·858.

RESULTS.

BAROMETER.

Max. on the 21st at 11 & 12 P.M. 30·026
Min. on the 21st at 6 A.M. 29·935
} Mean 29·9805

Max. on the 22d at 6 A.M. 30·060
Min. on the 22d at 1 A.M. 30·030
} Mean 30·045

Range of the Barometer on the 21st 0·091 inch. Range of the Barometer on the 22nd 0·030 inch. Whole Range 0·121 inch.

THERMOMETER.

Max. hourly readings on the 21st at 2 P.M. 61·7
Min. hourly readings on the 21st at 7 A.M. 45·5
} Mean 53·6

Max. hourly readings on the 22d at 1 A.M. 48·6
Min. hourly readings on the 22d at 6 A.M. 43·8
} Mean 46·2

Range of Thermometer on the 21st 16·2 Range of Thermometer on the 22nd 4·6 Whole Range 20·8

SELF-REGISTERING THERMOMETER.

MAXIMA ON THE 21ST.

On the Earth . . . . 60·0
4 feet above ditto . . . . 60·9
30 feet above ditto . . . . 64·0
} Mean 61·63

MINIMA ON THE 21ST.

On the Earth . . . . 39·8
4 feet above ditto . . . . 45·5
30 feet above ditto . . . . 40·0
} Mean 41·76

Range of Min. and Max. on the earth, 21·8. 4 feet above the earth, 15·4. 30 feet above the earth, 24·0

Max. dew point, Daniell's hygrometer 51°
Min. dew point 45
} Mean 48°

MAXIMA ON THE 22ND.

On the Earth . . . . 58·0
4 feet above ditto . . . . 60·0
30 feet above ditto . . . . 63·3
} Mean 60·43

MINIMA ON THE 22ND.

On the Earth . . . . 40·0
4 feet above ditto . . . . 42·0
30 feet above ditto . . . . 38·0
} Mean 40·00

Range of Min. and Max. on the earth, 18·0. 4 feet above the earth, 18·0. 30 feet above the earth, 25·3.

Max. dew point, Daniell's hygrometer 47°
Min. dew point 43
} Mean 45°

APPENDIX II.

RETROSPECT FOR 1837.

AT

EIGHT STATIONS IN GREAT BRITAIN,

WITH NOTICES EXPLANATORY OF

TABULÆ METEOROLOGICÆ.

TABULÆ METEOROLOGICÆ

WAS ARRANGED FROM TABLES DERIVED FROM THE FOLLOWING SOURCES:—

LONDON.
The Royal Society's Transactions.

BEDFORD.
Captain W. H. Smyth, R.N., K.S.F., V.P.R.S.
Member of the French Institute, &c.

DERBY.
The Philosophical Institution.

THETFORD.
H. W. Bailey, Esq. M.R.C.S. &c.

SWANSEA.
The Royal Institution of South Wales.

HIGH WYCOMBE.
Samuel Luck Kent, Esq. F.G.S. &c.

CHELTENHAM.
Samuel Moss, Esq.

GOSPORT.
The Royal Academy, by J. H. Maverly, Esq.

*** An alteration in the original design has occasioned an irregularity in the paging of this Appendix.

NOTICE.

To those societies and gentlemen who have kindly favoured us with the loan of their tables, we beg to offer our grateful acknowledgments, and trust from the increasing interest now felt in this long-neglected branch of physical science, observers in all parts of the United Kingdom will favour us with their journals of the past and future years, in order that they may be arranged on a plan similar to "Tabulæ Meteorologicæ."

No remark need be offered either to show the utility of tables arranged in the form of "Tabulæ Meteorologicæ," or the labour necessarily attending a work of such magnitude. The expense can only be paid by a large sale; and, therefore, it is hoped the public will encourage it as an attempt to reduce the phenomena of more distant parts, and to place them within the "optic glance" of an individual observer.

The introduction of meteorological *signs* to exhibit the phenomena of the atmosphere will be found generally advantageous; they not only enable us to compare atmospherical phenomena more readily than *letters* (which interfere with those used to denote the direction of the wind), but they may also be used by observers in all parts of the world, without affecting, or being affected by, their several languages.

London, *January* 31*st*, 1839.

RETROSPECT FOR 1837 AT LONDON, MIDDLESEX.

JANUARY.—The new year was introduced with fair weather and a high barometer. On the 2nd, the wind veered round to the south, and unpleasant weather followed. On the 4th, the wind changed to WSW.; a dense fog came on at A.M. followed by a thaw, and in the evening the snow disappeared. Alternations of cloudy, overcast, and gloomy weather, with occasional fogs, prevailed until the 25th, when the wind veered from WSW. to south, accompanied with violent gusts and heavy rain. On the 26th, the wind became westerly, blowing strong, and attended with heavy rain.

FEBRUARY.—This month was ushered in with a dense fog and high temperature. The barometer continued to rise until the 6th, in consequence of the prevalence of easterly winds; the days were generally clear; the nights particularly so. The wind veered to the south on the 14th, accompanied with rain. Alternations of cloudy and wet weather until the 25th, when the wind changed to the WNW., and fair weather ensued.

MARCH.—This month, like the month of January, was ushered in with a high barometer, and from the frequent changes from northerly to south-westerly winds, much fickleness of the weather ensued. Snow fell in the night of the 22nd and morning of the 28th.

APRIL.—This month has been unusually fair in consequence of northerly winds prevailing. Rain did not fall until the 21st day. The temperature has been uniform, and low for the season.

MAY.—The weather has been very fickle this month, occasioned by the frequent changes in the wind. A thunder-storm, accompanied with lightning and heavy rain, occurred on the 14th. The range of temperature has been variable; the pressure of the atmosphere has been more steady.

JUNE.—The "glorious first of June" was introduced with heavy rain, but it cleared up in the evening, and became clear. On account of the prevalence of south-westerly winds during the former part of the month, overcast and cloudy weather predominated until the 23rd, when the wind veered ENE., and fair weather ensued.

JULY.—The month entered with fair weather and a high barometer, and the wind blowing brisk from the east: intermissions of clouds and sunshine, with a falling barometer, continued until the 5th, when light rain fell in the evening, amounting to ·033 of an inch. Fair weather prevailed until the 14th, when a brisk wind set in from the south, accompanied with heavy showers of rain; at 7 P.M. a rainbow was visible. On the morning of the following day (15th) there were several dark, threatening clouds; much rain fell in the afternoon but the evening was fair and clear. Variable weather prevailed until the 29th, when a strong wind set in from SE. varying, and the barometer fell suddenly at 11 A.M., attended with a heavy shower of rain. The wind continued very high during the night, but abated on the following day, veering to the south-west. The month ended with cloudy and wet weather.

The annexed table shews the maxima, minima, and range of pressure and temperature, and the days of their occurrence at London, in the month of July, for 54 years inclusive.

Maxima, Minima, and Range of Pressure and Temperature at London, in the Month of July, for 54 Years.

Year.	PRESSURE.					TEMPERATURE.				
	Max in. dec.	Day of Month.	Min. in. dec.	Day of Month.	Range.	Max.	Day of Month.	Min.	Day of Month.	Range.
1780	29·95	28	29·20	18, 22	0·75	71°	18	60	8	11°
1783	30·60	1, 5	29·14	21, 27	1·46	84	11	59	4	25
1784	30·20	15	29·03	19, 20	1·17	75	7, 8	58	23	17
1786	30.	1	29·63	29	1·23	78	11	53	10	25
1787	30·50	19	29·40	24	1·10					
1788	30·90	24	29·80	4, 5	1·10	88	1	58	5	30
1789	30·50	10	29·67	13	0·83	74	3	50	24	24
1790	30·13	17	29·50	31	0·83	73	8, 9, 27, 28	51	7	22
1791	30·24	15	29·45	11	0·79	74	31	50	6	24
1792	30·40	14	29·56	27	0·84	77	16	52	22	25
1793	30·26	6	29·70	19	0·56	89	7, 16	52	1	37
1794	30·28	9	29·49	24	0·79	86	13	58	25, 26	28
1795	30·25	6	29·78	22	0·47	75	30	50	7	25
1796	30·23	20	29·51	6	0·72	73	30, 31	52	10	21
1797	30·10	23	29·60	30	0·40	84	14	56	6, 21	28
1798	30·14	29	29·39	17	0·75	75	4	50	23	25
1799	30·20	6	29·26	18	0·94	76	7	46	28	30
1800	30·46	25	29·96	2	0·50	79	23	55	28	24
1801	30·03	20	29·30	16	0·73	77	21	54	2	23
1802	30·06	24	29·48	21	0·58	70	8	50	2	20
1803	30·40	11	29·97	29	0·43	83	2	54	5, 13, 14, 25	29
1804	30·21	12, 13	29·45	23	0·76	78	31	50	11	28
1805	30·21	1	29·28	23	0·93	71	10	53	11	18
1806	30·15	2	29·50	23	0·85	77	10	54	20	23
1807	30·28	8	29·61	31	0·67	79	28	54	1	25
1808	30·20	11	29·52	28	0·68	78	14, 31	53	3	25
1809	30·20	14	29·48	4	0·72	77	25	49	3	28
1810	30·16	23	29·54	11	0·62	75	11	52	21	23
1811	30·21	27	29·79	21	0·42	85	28	51	30	34
1812	30·36	11	29·55	28	0·81	73	7, 9	49	4, 5	24
1813	30·13	3	29·51	24	0·82	76	7	50	3	26
1814	30·20	23	29·75	15	0·45	85	28	54	16	31
1815	30·14	10	29·64	19	0·50	76	12,13,14, 16	52	2	24
1816	29·92	27	29·34	17	0·58	74	20	52	4, 28	22
1817	29·99	24	29·20	15	0·79	74	10	50	28	24
1818	30·27	15	29·75	12	0·52	87	24	57	2	30
1819	30·28	13	29·42	20	0·86	81	4	51	31	30
1820	30·30	1	29·46	18	0·84	74	1	50	5	24
1821	30·36	18	29·64	22	0·72	74	18, 19	50	12, 13, 1	24
1822	30·25	8	29·43	12	0·82	76	4	51	31	25
1823	30·01	5	29·56	23	1·05	73	5	52	16, 25	21
1824	30·50	19	29·64	2	0·86	79	29	52	26	27
1825	30·33	5	29·86	1	0·47	81	15	50	6	31
1826	30·33	27	29·77	13	0·56	81	31	56	26	25
1827	30·44	6	29·75	1	0·69	76	29	40	23	36
1828	29·89	1	29·29	20	0·60	81	8	54	14	27
1830	30·30	27	29·57	13	0·73	77	27	55	30	22
1831	30·27	7	29·53	5	0·74	77	9, 13	54	29	23
1832	30·34	15	29·77	25	0·57	82	17	56	26	26
1833	30·37	30	29·60	23	0·77	75	28	53	23	22
1834	30·20	1	29·48	18	0·72	84	16	56	24	28
1835	30·23	23	29·84	10, 13	0·39	84	28	54	1	30
1836	30·20	4	29·60	21	0·60	84	5	48	20	36
1837	30·30	1, 23	29·68	3	0·62	80	23	49	1	31

August.—The month was ushered in with a strong wind from the south-east, a falling barometer, and occasional showers, which continued until the 5th, when it became fair, and the barometer rose rapidly. Alternations of fair and cloudy weather prevailed until the 26th, when the wind having changed from E to SSW., the barometer fell nearly four-tenths, accompanied with heavy rain, and distant thunder and lightning. On the 29th, light rain fell during the whole day, with the wind from the NE., and during the twenty-four preceding hours, the barometer sank nearly half an inch, and continued falling until A.M. of the following day, when there was thunder and lightning, with occasional showers.

The annexed table shews the maxima, minima, and range of pressure and temperature, and the days of their occurrence at London, in the month of August, for 51 years inclusive.

Maxima, Minima, and Range of Pressure and Temperature at London, in the Month of August, for 51 Years.

Year.	PRESSURE.					TEMPERATURE.				
	Max. in. dec.	Day of Month.	Min. in. dec.	Day of Month.	Range.	Max	Day of Month.	Min.	Day of Month.	Range.
1786	30.10	25	29·07	14, 15	0·95	81°	11	64°	21	17°
1787	30·43	3	29·34	25	1·09	81	9	49	26	32
1788	30·50	2, 3, 4	29·30	14	1·20	83	4	55	9	28
1789	30·31	18	29·70	31	0·61	80	29	53	1, 2	27
1790	30·15	30	29·67	1, 3	0·48	73	8, 9	51	30	22
1791	30·45	19	29·80	29	0·65	81	14	51	29	30
1792	30·17	8	29·36	23	0·81	84	12	52	19	32
1793	30·23	21	29·46	17	0·77	81	3	50	25	31
1794	30·32	13	29·51	7	0·81	81	17	54	7	27
1795	30·30	29, 30, 31	29·74	22	0·56	78	12, 13, 31	52	5	26
1796	30·50	16	29·90	2, 10	0·60	79	22	54	3, 27	25
1797	30·	23	29·52	1	0·48	73	8	54	22	19
1798	30·34	27	29·15	24	1·19	79	26	52	27, 29	27
1799	30·19	26	29·21	7	0·98	72	13	49	31	23
1800	30·38	8	29·70	22	0·68	87	2	50	24	37
1801	30·22	7	29·56	31	0·66	78	16	56	3	22
1802	30·28	15, 29	29·72	25	0·56	82	29	54	22	28
1803	30·38	27	29·88	10	0·50	78	14,16,17,18	48	31	30
1804	30·30	1, 26	29·50	14	0·80	80	1	49	13, 22	31
1805	30·18	23	29·44	2	0·74	76	11	54	19	22
1806	30·20	17	29·30	29	0·90	77	9	54	14	23
1807	30·23	16	29·78	28	0·45	79	13, 22	54	30	25
1808	30·22	21	29·60	31	0·62	77	4, 5, 11, 18	55	29	22
1809	30·08	29	29·39	3	0·69	76	30	49	25	27
1810	30·26	21	29·50	15	0·76	77	31	49	16, 17	28
1811	30·29	14	29·55	26	0·74	76	2	50	6	26
1812	30·17	14	29·76	3	0·41	76	18	51	5, 7, 8	25
1813	..	..	..	..	..	..	..	..	..	..
1814	30·27	31	29·52	24	0·75	78	1	51	19	27
1815	30·..	..	29·..	..	0·..	..	..	..	..	..
1816	30·22	25	29·55	15	0·67	70	4	52	26	18
1817	30·06	22	29·01	26	1·05	73	7	52	25	21
1818	30·22	23	29·77	27	0·45	85	5	54	11	31
1819	30·50	21	29·56	26	0·94	74	8, 9	43	16	21
1820	30·30	11	29·58	28	0·72	76	1, 14	50	21	26
1821	30·30	25	29·54	10	0·76	80	21	52	28	28
1822	30·29	17	29·74	26, 27	0·55	80	21	50	2	30
1823	30·30	28	29·54	16	0·76	78	13	51	16	27
1824	30·38	25	29·75	6	0·63	79	29	50	23	29
1825	30·38	20	29·50	18	0·88	76	30, 31	54	10, 19	22
1826	30·30	18	29·71	25	0·59	81	20	56	12	25
1827	30·40	29	29·	19	1·40	76	2	49	25	27
1828	30·30	26	29·43	9	0·87	76	4, 25	51	15	25
1829	30·20	2	29·32	19	0·88	75	8	50	27	25
1830	30·18	31	29·57	13	0·61	79	3	50	29	29
1831	30·20	29	29·53	5	0·67	77	9, 13	58	18	19
1832	30·26	11	29·30	28, 29	0·96	83	10	55	30	28
1833	30·33	2	28·80	31	1·53	75	28, 29	49	31	26
1834	30·10	16, 17	29·60	20, 30	0·50	77	17	50	13, 24	27
1835	30·30	9	29·56	24	0·74	84	21	53	28	29
1836	30·36	11	29·28	6	1·08	74	13	50	24	24
1837	30·35	8	29·40	31	0·95	81	17	49	30	32

SEPTEMBER.—The ninth month was ushered in with an unfavourable aspect, viz., a low barometer and the prevalence of a westerly wind, inducing clouds and rain. Alternations of cloudy, overcast, and fair weather, with light winds, continued until the 25th, when the wind set in from the north-east, and fair settled weather ensued. During the former part of the month, few days passed without rain, but from the 17th to the end of the month no rain fell, and the fluctuation of the barometer was on account of the variable force of the wind. On the 13th the barometer fell to 29·096, the wind blowing lightly from the south, and attended with but little rain.

The annexed table shews the maxima, minima, and range of pressure and temperature, and the days of their occurrence at London, in the month of September, for 52 years inclusive.

Maxima, Minima, and Range of Pressure and Temperature at London, in the Month of September, for 52 Years.

Year.	PRESSURE.					TEMPERATURE.				
	Max. in. dec.	Day of Month.	Min.	Day of Month.	Range in. dec.	Max.	Day of Month.	Min.	Day of Month.	Range.
1786	30·45	20	29·11	14	1·34	68°	11, 13	42°	20	26°
1787	30·47	3	29·24	18	1·23	69	5, 26	49	28, 29	20
1788	30·50	3	29·42	21	1·08	75	4	50	21	25
1789	30·24	25	29·38	4	0·86	75	10	46	16	29
1790	30·38	26	29·41	3	0·97	72	19	44	27	28
1791	30·38	29	29·72	18	0·66	78	11	43	19	35
1792	30·28	16	29·03	23	1·25	70	2	43	22	27
1793	30·40	27	29·38	15	1·02	69	14	42	22	27
1794	30·38	29	29·29	10	1·09	69	16, 17	41	26	28
1795	30·45	15	29·76	4, 5	0·69	81	7	51	28	30
1796	30·39	30	29.63	21	0·76	77	10, 17	40	30	37
1797	30·12	16	29·18	11	0·94	71	1	45	9	26
1798	30·18	17	29·01	28	1·17	76	2	42	30	34
1799	30·37	5, 6	29·22	19	1·15	69	5, 6	46	2, 28, 29	23
1800	30·16	13	29·12	7	1·04	78	17	49	29	29
1801	30·24	16	29·32	6	0·92	74	7	48	23	26
1802	30·38	30	29·46	10	0·92	75	4	47	7	26
1803	30·40	5	29·62	21	0·78	72	9	40	23	32
1804	30·45	26	29·92	23	0·53	82	16	46	25	36
1805	30·60	29	29·36	7	1·24	75	18	42	24	33
1806	30·26	19	29·55	9	0·71	72	1	47	24	25
1807	30·20	1	29·39	25	0·81	72	4	40	17	32
1808	30·30	21	29·31	9	0·99	68	1, 15	40	29	28
1809	30·10	16	29·29	7	0·81	70	2, 5, 6	45	25	45
1810	30·32	7	29·61	12	0·71	80	2	47	13	33
1811	30·30	2	29·15	27	1·15	76	11	48	26, 27	28
1812	30·26	13	29·74	28	0·52	72	21	42	18	30
1813	30·29	16	29·28	6	1·01	68	3, 11	46	30	22
1814	30·34	1	29·63	25	0·71	75	20	49	13	26
1815	30·21	10, 11	29·52	30	0·69	78	14, 15	50	5,6,27,30	28
1816	30·17	30	29·39	1	0·78	70	15	46	2	24
1817	30·12	5	29.22	26	0·90	74	3	48	27	26
1818	30·16	14	29·42	21	0·74	75	4	48	16	27
1819	30·50	21	29·56	26	0·94	74	8, 9	42	15	32
1820	30·45	11	29·65	18	0·80	73	11, 14	45	19, 26	28
1821	30·27	15, 16	29·57	29	0·70	73	2, 4, 6	49	29	24
1822	30·24	14, 27	29·33	24	0·91	72	17	44	13	28
1823	30·35	8	29·34	30	1·01	75	4, 13	42	28	33
1824	30·22	17	29·55	6, 30	0·67	80	1	41	27	39
1825	30·37	28	29·44	14	0·93	76	1	48	29	28
1826	30·90	19	29·30	6	1·60	70	4, 17	45	22	25
1827	30·37	1	29·56	22	0·81	67	16	45	19	22
1828	30·50	16	29·44	12	1·06	79	8	48	16, 22	31
1829	30·20	30	29·16	18	1·04	64	6, 26	40	24	24
1830	30·30	27	29·20	21	1·10	70	1, 2	47	24, 30	23
1831	30·20	13, 16, 24	29·48	30	0·72	74	5	51	10, 22	23
1832	30·48	21	29·18	7	1·30	75	26	46	19	29
1833	30·23	5	29·50	1, 17	0·73	68	7	48	5	20
1834	30·48	14	29·40	9	1·08	77	17	50	13	27
1835	30·20	2	29·28	12	6·92	76	4	48	12	28
1836	30·20	22	29·28	16	0·92	70	1	43	30	27
1837	30·30	20	29·10	13	1·20	72	17	38	28	34

October.—A fog on the first day announced the near approach of "winter's gloom." On the 2nd, the wind changed from the NE. to SSW. with light rain A.M., and fair and clear P.M. On the morning of the 3rd, a thick fog came from the south-east, and in the evening light rain fell. The barometer continued high notwithstanding the prevalence of south-westerly winds: no rain fell until the 23rd, when the barometer began to fall rapidly, and on this and the following day the rain was heavy, with light wind from SSW. A northerly wind on the 25th caused the barometer to rise, although accompanied with light rain the whole of the day. On the evening of the 26th, a high wind set in from the south-west, which increased during the night, varying to the south, and became light on the following day; after which the barometer rose, but fell again the next day, attended with light clouds, wind, and rain. The barometer began to rise on the 31st, with a fair day, and in the evening a strong wind commenced from the south-west.

The annexed table shews the maxima, minima, and range of pressure and temperature, and the days of their occurrence at London, in the month of October, for 54 years inclusive.

Maxima, Minima, and Range of Pressure and Temperature at London, in the Month of October, for 52 Years.

Year.	PRESSURE.				TEMPERATURE.					
	Max. in. dec.	Day of Month.	Min. in. dec.	Day of Month.	Range.	Max.	Day of Month	Min.	Day of Month.	Range.
1786	30·43	20, 27	29·44	12	0·99	61°	3	40°	18,29,30,31	21°
1787	30·40	20	29·25	13	1·15	67	2	40	12, 14	27
1788	30·62	8	29·70	16	0·92	69	2	38	18	31
1789	30·25	25	29·16	8	1·09	65	20	34	31	31
1790	30·33	16	29·67	28	0·66	68	7	38	31	30
1791	30·40	29	28·90	21	1·50	66	5	35	23, 24	31
1792	30·28	25	29·17	14	1·11	61	1	39	24	22
1793	30·48	17	29·15	31	1·33	68	13	36	31	32
1794	30·35	21	29·18	5	1·17	62	15, 16	37	28	25
1795	30·21	7	29·20	11	1·01	67	2	43	30	24
1796	30·65	25	29·51	7	1·14	59	3, 4	34	24	25
1797	30·36	13	29·21	25	1·15	66	6	36	21	30
1798	30·38	13	29·30	30	1·08	63	2	36	12	27
1799	30·32	27	29·42	24	0·90	62	6	39	27	23
1800	30·19	19, 20	29·11	10	1·08	64	2, 7, 8	39	21, 22	25
1801	30·22	26	28·88	18	1·34	67	12	35	21	32
1802	30·43	14	29·37	29	1·06	74	2	38	31	36
1803	30·46	26	29·70	8	0·76	66	21	39	4	27
1804	30·14	6	29·21	30	0·93	66	3	42	12, 15	24
1805	30·40	1, 31	29·19	16	1·21	63	2, 8	34	30	29
1806	30·29	9	28·75	22	1·54	64	4, 6	30	25	34
1807	30·25	19	29·24	23	1·01	67	7	40	27, 28	27
1808	30·32	31	29·20	15	1·12	63	5	38	17	25
1809	30·34	3	29·82	24	0·52	63	3, 26	36	13	27
1810	30·25	4	29·35	22	0·90	66	7	32	30	34
1811	30·22	19, 20	28·69	26	1·53	70	15, 16	44	27	26
1812	30·00	3	28·57	19	1·43	66	3, 4	36	28	30
1813	30·15	26	28·70	15	1·40	63	5	35	29	28
1814	30·23	4	29·12	19	1·11	59	3, 15	38	9	21
1815	30·29	8	29·43	20	0·86	63	16	44	29	19
1816	30·00	..	29·..	..	..	..	..	..	..	..
1817	30·26	13	29·20	29	1·06	57	7, 30	38	12, 29, 31	19
1818	30·25	29	29·35	6	0·90	69	16	47	7, 8	22
1819	30·39	15	29·42	24	0·97	78	12	35	28	43
1820	30·68	3	28·73	24	1·95	62	15	40	28	22
1821	30·39	14	29·02	20	1·37	65	3	44	15, 24	21
1822	30·20	11	29·35	16	0·85	66	3, 5	45	27	21
1823	30·47	26	28·88	1	1·59	61	7	40	2, 13, 31	21
1824	30·17	18	28·72	12	1·25	65	8	33	16	32
1825	30·55	15	29·20	19	1·35	66	4, 5, 6	35	20	31
1826	30·18	14	29·42	25	0·76	65	21	41	26	24
1827	30·38	4	29·27	22	1·11	61	2, 5	35	30	26
1828	30·40	12	29·40	6	1·00	67	22	36	30	31
1829	30·37	10	29·38	7	0·99	65	18	36	31	29
1830	30·49	10	29·30	28	1·19	69	21, 22	40	26	29
1831	30·38	18	29·30	1	1·08	70	7	47	29	23
1832	30·38	25	29·51	21	0·87	70	11	45	26	25
1833	30·23	1	29·20	15	1·03	65	24, 29	42	19	23
1834	30·60	29	29·33	17	1·27	75	5, 6	37	26	38
1835	30·50	18	28·98	10	1·52	64	6	38	27	26
1836	30·40	20, 23	29·15	1	1·25	61	15	29	30	32
1837	30·66	14	29·25	30	1·41	71	2	39	25	32

NOVEMBER.—A strong wind from SSW. and a very low barometer ıshered in the month of November. The wind increased during the ıight, and on the morning of the following day it became more westerly, ›ut with less force, and the barometer commenced rising: at P.M. the vind became light, from the west, with small rain and clouds. There vas a fog A.M. and P.M. on the 3rd, of but little density, and occaional flashes of lightning in the evening: the barometer continued o rise, with an easterly wind, until the 8th, when it reached the naximum of the month, and a dense fog prevailed throughout the lay. Alternations of fair and cloudy weather, with light clouds and wind, prevailed until the evening of the 22nd, when a high wind commenced from the south-west, which on the following day veered to the south (variable) with a falling barometer and light rain in the evening; the barometer afterwards rose. Fair and cloudy weather, with occasional light rain, prevailed until the end of the month.

The annexed table shews the maxima, minima, and range of pressure and temperature, and the days of their occurrence at London, in the month of November, for 52 years inclusive.

Maxima, Minima, and Range of Pressure and Temperature at London, in the Month of November, for 52 Years.

Year.	PRESSURE.					TEMPERATURE.				
	Max. in. dec.	Day of Month.	Min. in. dec.	Day of Month.	Range.	Max.	Day of Month.	Min.	Day of Month.	Range.
1786	30·60	10	29·00	20	1·60	50°	28	31°	13	19°
1787	30·45	29	29·11	9	1·34	59	11	32	25	27
1788	30 53	16	29·63	4	0·90	60	3	28	27	32
1789	30·40	27	28·73	7	1·67	50	13	31	26, 27	29
1790	30·40	28	29·10	21	1·30	58	5	31	29	27
1791	30·22	26	28·78	18	1·44	53	10,23, 24,28	32	6	21
1792	30·42	20	29·35	14	1·07	56	4	35	30	21
1793	20·37	30	29·20	13	1·17	55	19	38	8	17
1794	30·21	15	29·15	5	1·06	57	1	32	19	25
1795	30·60	11	29·07	25	1·53	57	7	31	20	26
1796	30·42	26, 28	29·50	17	0·92	58	2	25	30	33
1797	30·46	10	29·31	22	1·15	59	6	27	23	32
1798	30·28	17	28·78	8	1·50	59	1	30	18	29
1799	30·36	20	28·86	1	1·50	57	12	35	9	22
1800	30·23	20	28·50	9	1·73	59	21	36	19, 27, 28	23
1801	30·77	17	28·76	2	2·01	57	23	28	28	29
1802	30·11	9	29·16	21	0·95	53	22	34	9, 10	19
1803	30·30	30	28·70	11	1·60	55	8	34	14	21
1804	30·25	3	29·20	10	1·05	57	13	32	28	25
1805	30·65	15, 16	29·25	30	1·40	54	29, 30	38	21	16
1806	30·30	8	29·02	21	1·28	59	1	37	22	22
1807	30·03	14	28·72	20	1·31	51	2, 7	28	27	23
1808	30·28	1	28·77	18	1·51	54	25, 26	32	14	22
1809	30·40	8	29·11	26	1·29	51	1	31	15, 16	20
1810	30·18	13	28·50	10	1·60	54	15	34	30	20
1811	30·40	27	29·32	11	1·08	63	2	32	22	31
1812	30·27	23	28·96	17	1·31	56	1	29	22	27
1813	30·26	4	29·17	16	1·09	58	9, 11	28	30	30
1814	30·12	11	29·32	8	0·80	53	19	30	21, 22	23
1815	30·63	26	29·06	14	1·57	56	10	28	16, 23	28
1816	30·49	30	28·80	9	1·69	51	4, 20	26	24	25
1817	30·40	19	28·40	8	2·00	59	17	40	24	19
1818	30·40	27	28·08	1	2·32	60	5	37	22	23
1819	30·10	18	28·20	21	1·90	54	4, 5	32	27	22
1820	30·34	29	28·56	13	1·78	56	7, 8	31	16	25
1821	30·35	6	29·36	4	0·99	62	2	37	5	25
1822	30·31	4	29.25	16	1·06	62	1	36	29	26
1823	30·65	11	29·50	30	1·15	56	6, 7	34	12	22
1824	30·81	27	28·52	23	2·59	58	2	35	5	23
1825	..	..	..	..	..	..	..	..	..	..
1826	30·95	7	29·11	14	1·84	53	11	31	25	22
1827	30·36	5	29·39	29	0·97	60	13	27	22, 24	33
1828	30·30	3	29·09	6	0·91	60	28	26	11	34
1829	30·37	19	29·51	24, 25	0·86	57	12	30	20	27
1830	30·37	24	29·04	9	1·33	60	1	37	23	23
1831	30·50	29	29·30	6,15,16	1·20	59	6	31	17	28
1832	30·33	7, 17	29·45	28	0·88	64	1	39	4,5,6,8,9,29	25
1833	30·24	13	29·47	7	0·77	58	6	35	25	23
1834	30·38	15	29·46	7, 8	0·92	63	6	35	19	28
1835	30·34	11	29·79	22	0·55	55	23, 24, 25	34	10	21
1836	30·07	21	29·10	18	0·97	55	13	33	6	22
1837	30·40	7	28·87	1	1·53	57	1	29	8	28

DECEMBER.—A rising barometer and a fair and mild day introduced the last month of the year. On the 2nd, a thick fog prevailed throughout the day, although the wind was from the south-west. A light wind from ENE. commenced on the 3rd with deposition, and in the evening a fog. A thick fog and white frost on the morning of the 4th; about P.M. the barometer began to fall; light snow on the 6th and 7th; overcast with occasional rain on the 8th and 10th; thick fog on the 13th at A.M. On the 17th, the barometer began to fall rapidly, and in the evening heavy rain fell and a strong wind commenced from the south-east, which continued throughout the night and following day, changing at A.M. from south-east to south-west; the barometer began to rise at noon, and in the evening light rain fell, in the early part of the night it reached its maximum strength, and afterwards veered to WSW. Light wind A.M. on the 20th, P.M. light rain and snow, and in the evening the gale returned with renewed force from the south-west; on the following day the wind blew from the north, and the barometer rose. Mild, overcast, and cloudy weather prevailed until the end of the month.

The annexed table shews the maxima, minima, and range of pressure and temperature, and the days of their occurrence at London, in the month of December, for 47 years inclusive.

Maxima, Minima, and Range of Pressure and Temperature at London, in the Month of December, for 47 Years.

Year.	PRESSURE.					TEMPERATURE.				
	Max. in. dec.	Day of Month.	Min. in. dec.	Day of Month.	Range.	Max.	Day of Month.	Min.	Day of Month.	Range.
1786	30·	24	28·99	6	2·01	50°	7, 9, 10	23°	26	27°
1787	39·93	7, 8	29·24	25	0·69	55	11	31	23, 24	24
1788	30·60	11	29·59	14	1·01	46	25	21	15	25
1789	30·48	11	28·97	15	1·51	53	6, 22	32	16, 25	21
1790	30·36	6	28·83	18	1·53	53	11	31	26	22
1791	30·35	17	29·07	4	1·28	50	2	24	9, 11	26
1792	30·27	3	29·37	23	0·90	55	5	29	23	26
1793	30·31	6	28·65	11	1·66	57	18	32	4, 6	25
1794	30·46	16	29·56	26	1·90	56	3	27	24	29
1795	30·57	25	29·54	13	1·03	57	6	39	25	17
1796	30·68	10	29·48	19	1·20	47	6, 19	15	24	32
1797	30·44	21	29·31	2	1·13	56	19	31	11	25
1798	30·42	21, 24	29.30	16	1·12	49	17	13	26	36
1799	30·27	20	29·21	2	1·06	50	1	23	19	27
1800	30·18	16	28·78	5	1·40	53	22	33	10	20
1801	30·01	19	28·72	9	1·29	53	5	24	19	29
1802	30·26	19	29·14	16	1·12	49	20	30	18	19
1803	30·50	1	29·16	21	1·34	54	24	21	9	33
1804	30·36	19	29.09	5	1·27	47	11, 13, 14	24	22	23
1805	30·38	17	28·85	22	1·53	53	7	25	12	28
1806	30·28	24	28·80	2	1·48	55	16, 17, 28	34	21	21
1807	30·35	21	29·45	8	0·90	50	26	24	10	26
1808	30·32	13	29·04	22	1·28	52	6	25	17	27
1809	30·02	8	28·31	17	1·71	58	4	33	2	25
1810	30·30	16	29·05	25	1·25	52	13	30	8, 11	22
1811	30·19	22	29·02	9	1·17	53	13, 19	24	5	29
1812	30·48	7	28·92	17	1·56	53	2	25	8	28
1813	30·34	26	29·20	18, 19	1·14	51	18	27	14	24
1814	30·08	20	29·35	8	0·73	56	12, 18	30	3	26
1815	30·43	12	28·91	17	1·52	53	1	25	8	28
1816	30·49	1	28·82	15	1·67	50	24	24	21	26
1817	30·09	26	28·51	8	1·58	55	1	28	11	27
1818	30·35	23	28·48	4	1·87	53	8	26	17	27
1819	30·23	30	28·35	24	1·88	52	22	23	10	29
1820	30·40	20	29·54	13	0·86	54	4	30	25, 26	24
1821	30·26	11	28·44	25	1·82	53	10	35	3	18
1822	30·60	11, 12	29·10	2	1·50	47	14, 18	29	21, 26	18
1823	30·55	7	29·19	20	1·36	54	1	31	19	23
1824	30·85	8	28·90	22	1·95	55	25	30	10	25
1825	30·89	27	28·22	4	2·67	54	16, 18	30	27	24
1826	30·30	25	28·17	2	2·13	53	7, 10	33	5, 21	20
1827	30·38	25	29·	1	1·38	56	5	37	8	19
1828	30·38	14	29·16	8	1·22	56	18, 21, 22	35	25	21
1829	30·44	6	29·70	22, 23, 24	0·74	50	5	26	23, 25	24
1830	30·39	15, 16	28·90	9	1·49	50	22	20	24, 25	30
1831	30·28	25	28·90	7	1·38	57	1, 12	31	25	26
1832	30·37	11, 12	29·48	3	0·89	55	17	36	19	19
1833	..	..	..	..	..	..	..	..	..	..
1834	..	..	..	..	..	..	..	..	..	..
1835	..	..	..	..	..	..	..	..	..	..
1836	..	..	..	..	..	..	..	..	..	..

RETROSPECT FOR 1837, AT BEDFORD, BEDFORDSHIRE.

JANUARY.—The month was ushered in with all the garb of winter, and the surrounding country assumed a wintry aspect. On the 2d, the river Ouse was frozen; a calm air with alternate haze and sunshine, predicated a thaw, which commenced on the 3d. On the 6th, the snow had disappeared, and a stiff breeze commenced from WSW. which increased to a gale, changing its direction and becoming westerly on the following day. The three succeeding days were characterized by heavy squalls, attended with showers of rain. On the 11th, the wind became light from the north-west, and the minimum temperature fell to 25°. Alternations of fair, cloudy, and rainy weather with a moderate wind continued until the 25th, when a light breeze came on from the north-east with a dark and cloudy atmosphere; on the following day the wind E. by N. became variable with heavy squalls, and the sky uniformly dark, and continued so till the 28th, when light winds from ENE. rendered the atmosphere more congenial, and snow and sunshine characterized this and the succeeding day. On the 30th, the wind veered to SSE. with light snow and a cloudy sky.

FEBRUARY.—This month entered with a promising aspect, and comparatively a high minimum temperature, with light breezes, and occasional cloudy sky, and a high barometer. On the 6th, the thermometer fell to 28°·8, and the weather became fair, with a fresh breeze from SSE.; the 8th brought clouds and showers of rain. On the 10th, the wind veered to the SSW. with a strong breeze accompanied with showers; on the following day the wind blew with hard and heavy squalls from SW. and continued in strong gusts until the 14th, when it became nearly calm; on the 15th, the wind again became fresh from the SSW., in violent gusts on the 18th, which increased to a stiff gale on the following day, and the sky became cloudy with light showers. On the 22d the wind blew violently from the south-west; on the next day it increased to a furious gale, having changed its direction to the west-north-west; on the 24th it blew a stiff gale, and on the 25th the gale abated, and it became calm, with a light air from the west.

MARCH.—This month entered with a light wind from the north-west point and a frosty air. The barometer was high, occasioned by the northerly winds. On the 2d, there was a light breeze from the north, but it became calm the next day. On the 4th, a stiff gale commenced from the NNE. and on the following day the air became light from the

west with an over-cast sky : there was a light breeze and showers on the 6th ; calm and clear on the 7th ; fresh breeze from WSW. on the 8th, which increased to a stiff gale on the 9th, and on the 10th, became a hard gale, changing to the west point ; light air on the 11th from WSW. ; snow on the 12th, and on the 13th, fresh breeze from NNE. accompanied with snow and hail in the morning and rain in the evening. The 14th, wind NE. by N. var. and squally ; a strong breeze on the following day from north-east with cloudy sky ; light airs until the 18th, when a fresh breeze came on from NNE., 19th wind, NE. light breeze ; 20th strong breeze from north-east attended with rain ; 21st wind N.E. calm, snowed all day ; deep fall of snow on the mornings of the 22d and 23d ; fair weather until the 26th, when the wind shifted to the WSW. with a light breeze. On the following day, the wind became fresh, and increased to a strong breeze on the 28th, from the south-west, accompanied with light rain. Alternations of fair and cloudy weather terminated the month.

April.—Variable weather and a fresh breeze from the north-west introduced this month. A brisk gale from WNW. on the 3d, which continued until the 6th, veering to the north-east, and blew strong from this quarter until the 8th ; on the 9th the wind increased to a hard gale from the north, with occasional snow-showers, but lulled on the following day to a light, from NNE. ; and on the 11th it became perfectly calm, the air moving from the south, and the minimum temperature fell to 24°·1. On the 12th, there was a fresh breeze from the east, which lulled on the following day. Fair weather with cloudy skies and light airs prevailed until the 15th, when a strong breeze commenced from the north-west attended with sleet, the wind veered to the north on the succeeding day, and the sky assumed a threatening aspect ; the wind however became light on the 18th and was succeeded on the following day by a calm. The wind again became fresh on the 21st from ESE. and much rain fell ; 22d, the wind from NW. ; 23d, wind WSW. light breeze, continued rain ; the two following days were variable, and on the 26th a strong breeze set in from WSW. and the air became mild ; calm with fair weather, and then showers until the 30th, when it became very fair with a hard gale from the south-west.

May.—A most violent gale from the SSW. ushered in the month, but the wind became light on the 2d from west, and was followed on the 3d by a fresh breeze from the north-east. On the 4th, however, it became calm and continued so until the 9th, when squalls set in

from the north-east with snow showers, and on the succeeding day there were hard squalls from the north accompanied with sleet and a rising barometer. Alternate light and calm airs from W. and NW. prevailed until the 15th, when the sky assumed a threatening aspect, and there was a fair breeze from the north which lulled until the 18th, when it blew strong NNW. on the two following days it was N by E. and blew fresh; on the 21st it became nearly calm, but the next day the wind returned from N by W. increased to a stiff gale, and attended with hail; it again lulled, but continued to blow fresh from the south-west attended with fair weather. On the 30th, a strong wind set in from the north-west accompanied with hail and thunder. Rain fell on ten days this month, and the minimum temperature did not fall below 41°7. In consequence of the frequent changes of the wind and the circumstance of its variations being in opposite directions, the barometer kept constantly oscillating.

JUNE.—A rising barometer, fresh breeze and cloudy sky, introduces the first month of summer. North-west winds and fair weather prevailed, causing a high barometer; on the 8th, a strong breeze set in from NE. and the barometer which at 3 P.M. yesterday stood 30·75 inches, fell at the same hour this day, as low as 29·83 inches; on the 9th, there was a light breeze from the north-east; and on the following day, a strong breeze came on from the south-west, accompanied with rain, which continued until the 12th, when the wind became a light breeze, but on the succeeding day increased to a fresh breeze from S by W. which continued until the 14th, when it became fair, and the maximum temperature rose to 88°·5. Fresh and light breezes prevailed until the end of the month with alternate clouds and sunshine. The barometer has been uniformly steady, excepting on the night of the 7th, and the temperature of the latter part of the month high. Rain fell on nine days this month, and terrestrial evaporation has been great.

JULY.—This, like the preceding month, was ushered in with a fresh breeze and high barometer. North-east and north-west winds prevailed during the former part of the month, and the barometer was very steady. On the 13th, the wind veered to SSW. and a little rain fell. A light breeze on the 14th from SSW.; on the following day it became squally from WSW. which increased on the 16th to strong squalls accompanied with rain. On the 18th a gale from the WSW. attended with showers; squally again on the 20th, with a fresh breeze from the WNW. Fair weather with light airs and occasional breezes from the NW. and S. prevailed until the 28th, when a gale with hard

squalls set in from the south, and the barometer, which on the preceding day at 3 P.M. stood at 29·82 inches, now fell to 29·20 inches: this meteor reached its maximum on the following day, when it became stormy with hard squalls from the south-west quarter, and the barometer then rose. It was squally on the 30th, with a fresh breeze from the west, which on the 31st, veered to the north-west. During the latter part of the month in consequence of south-westerly winds, accompanied with rain; the range of the barometer has been very irregular. Rain fell on sixteen days this month, and the evaporation proceeded more rapidly than in the preceding month.

AUGUST.—The month entered with a threatening sky, a light breeze from the north-east, and a falling barometer: heavy squalls from SW. and showers on the 3d, and on the following day the barometer rose with a light air from the north-east. The pressure of the atmosphere continued to increase until the 8th, when a strong breeze from the ENE. occasioned a slight fall of the barometer, and the following day became squally—the sky assuming a threatening aspect. Fresh breeze from the south-west on the 10th, when a thunder storm occurred. The temperature continued to increase daily; a strong breeze from NE. by N. on the 16th, and on the following day it became calm, the air moving from ENE., a slight fall of the barometer took place, and there was much thunder attended with heavy rain. Squally on the 20th, from SSW. without rain, and on the succeeding day there was a strong gale from the west, which did not much affect the pressure of the atmosphere, but was attended with a diminution of temperature amounting to 4°. On the 23d, the wind blew from N. by E. and 1·300 inches of rain fell. Alternate rain and sunshine terminated the month, and the temperature diminished daily.

SEPTEMBER.—A stiff breeze with heavy rain and falling barometer introduced the ninth month. Alternations of rain, fair and cloudy weather prevailed until the 8th, when a fresh breeze set in from W by N. which became a stiff breeze on the following day, attended with rain and a falling barometer. On the 13th, there was a fresh breeze from SSW. and the barometer fell five-tenths; on the succeeding day the wind became more westerly, increasing to a stiff gale, accompanied with a rising barometer. Light airs, occasional breezes, and clouds and sunshine continued unto the end of the month, the wind during this period varying NNE. and N. The pressure and temperature have been on the whole uniform, and rain feel on fourteen days.

October.—This month has been very unfavourable, and although the wind was much unsettled, the barometer has been nearly uniform. On the 26th, there was a fresh breeze from the WSW. with squalls, and on the following day the wind veered to the west, and increased to a stiff gale, and the barometer fell four-tenths. Violent squalls from the south-west on the 30th, and a low barometer. On the 31st the wind blew in strong gusts from the west with a rising barometer. It has rained on eleven days this month.

November.—The month commenced with a low barometer and squalls from SSW., and on the 2nd, the wind increased to a strong gale from WSW. without rain. On the 3rd, the barometer rose, and fair weather ensued. From the 9th to the 15th gloomy weather prevailed, with but little intermission. On the 20th, a strong gale of wind set in from the south, accompanied with rain. A furious gale from the south-west on the 26th, attended with heavy rain. The month concluded with alternations of fair and cloudy weather.

December.—This month was ushered in with fair, mild weather. On the 4th, there was a dense fog, which was succeeded by a cloudy and gloomy atmosphere. The temperature continued very steady, with alternations of fair and cloudy weather. On the 18th, a strong gale set in from SSW. with rain: the following day became calm, but the rain continued, and on the 20th a gale again set in from SSW., but lulled on the 21st. The month ended with fair weather, a steady barometer, and high temperature.

RETROSPECT FOR 1837, AT DERBY, DERBYSHIRE.

JANUARY.—A remarkably fine day, with a northerly wind, and a high barometer ushered in the new year, and it continued fair, with the pressure diminishing rapidly until the 6th, when rain and a south-west wind set in. Alternate clouds and sunshine prevailed until the 12th, when snow fell heavily all the day, with a northerly wind and a rising temperature: this was succeeded by fair, cloudy and gloomy weather until the 24th, when, notwithstanding the wind was from the north-east, the barometer had fallen nearly to 29 inches and the rain fell prodigiously on this and the following day: rain, gloomy, and snowy weather characterized the three following days, the wind still continuing from the east, and the barometer gradually rising; on the morning of the 29th, the barometer again fell, accompanied with a deep fall of snow; in the afternoon the glass nearly regained its former elevation, and continued to rise gradually on the two following days, with gloomy weather. The temperature has not been low, although cold north-west and north-east winds have prevailed, excepting on the morning of the 11th, when the minimum temperature marked 20° Fahr.

FEBRUARY.—This month commenced with gloomy weather, and comparatively a mild temperature, the wind blowing from the south-east, and the barometer rising gradually. Wet, cloudy, and gloomy weather succeeded each other alternately, until the 10th, when the barometer sunk 28·99, and the rain fell plentifully, attended with a south-west wind. Rain and sunshine with a rising barometer prevailed until the 17th, when it became remarkably fine, and thunder was heard for the first time this year; showery weather succeeded, and on the 19th, the barometer sunk as low as 28·80 inches, but afterwards rose rapidly, and on the following day at 2 P.M. it rose to 29·89, or nearly one inch; it began again to fall on the night of the 21st, when, notwithstanding it was very fine, a heavy storm of hail occurred. On the following day it was fair with occasional showers. The 23d was a wet day; the four succeeding days were fine, with the wind from the north-east, but on the 28th, it again became gloomy, accompanied with snow and hail, and a rising barometer. In consequence of the wind continuing in the south-west and south east, the barometer has ranged low this month. The temperature has been more uniform; on the 27th it fell to 25° Fahr.

MARCH.—Fair weather, a high barometer, and a north-west wind introduced this month; this pleasant state of the atmosphere did not long continue: on the 3d, the wind veered to the east, and clouds with showers accompanied it; the barometer continued to fall; the following day was fair, and the minimum temperature fell to 27°. On the 5th, the wind changed to the west (by south) and rain immediately followed: on the succeeding day the wind returned to the north, and it became fair; this continued with a falling barometer until the 12th and 13th, when snow fell in abundance, and on the latter day the barometer rose nearly one inch and a quarter; the wind during the three preceding days, having blown from the north-east. It continued fair until the 20th, when the minimum temperature fell to 22°, and snow fell; the three following days were characterized by deep falls of snow; and although the wind was south on the 22d, the minimum temperature fell to 14°, on the succeeding day to 7°, and on the 24th it marked 11°: a thaw followed, and fair and cloudy weather continued until the 29th, when the minimum temperature marked 21°, and a storm of hail fell in the course of the day. The end of the month was fair. In consequence of the unsettled state of the wind, the barometer kept constantly vacillating.

APRIL.—The month entered unusually fair, with a north-east wind and low minimum temperature; indeed the minimum temperature was much lower than in the preceding months this year, and from the prevalence of northerly winds, cold was very severe. Snow fell on the 6th and 7th, and snow and rain on the 8th. It continued fair with a rising temperature, and decreasing pressure until the 16th, and following day, when snow again fell; this was succeeded by alternations of fair, gloomy, and wet weather, with a sinking barometer, until the end of the month,—the wind varying from the north-east to the south-west. From the 1st to the 24th, the minimum temperature was not above the freezing point.

MAY.—The month commenced with fine spring weather, and with the exception of the 6th, when we had rain, it continued fair until the 10th, when snow and rain fell, and the temperature decreased, attended with a northerly wind, and a falling barometer. From the 11th to the 16th, there were alternations of clouds, rain, and sunshine; but on the 17th, fair weather and a northerly, and afterward southerly wind, accompanied with a high temperature, set in until the 29th, when there were showers of rain, and on the night of the following, much rain fell. The barometer ranged low this month, and did

not reach 30 inches; the temperature has been very variable, and the minimum temperature was below 32° but thrice during the month; on the 26th, 27th and 28th, the maximum thermometer marked 84° Fahrenheit. Rain and snow fell on six days, and south-westerly winds prevailed.

JUNE.—Fair weather and a high temperature welcomed the gay month of June. There was thunder on the 6th and following day without rain. On the 9th, however, the barometer began to fall rapidly, and wet weather prevailed until the 13th, when the rain was accompanied with thunder. The two succeeding days were fine, attended with thunder, but no rain; on the latter day the thermometer reached 86° Fahr. and at noon there was a heavy storm accompanied with thunder; it continued to rain until the 20th, when it became fair, and the barometer rose gradually. Warm and fair summer weather predominated until the end of the month; the wind veered from the south to the east on the 25th, which reduced the maximum temperature of the succeeding days from 87° to 83° Fahrenheit. South-westerly winds prevailed, and, as was the case last month, the barometer did not rise so high as thirty inches, nor sink lower than 29·40 inches. Rain fell on ten days this month.

JULY.—Summer weather still prevails, and the wind continues to blow from the north-east; the atmosphere appeared in perfect equilibrium, but its balance was destroyed on the 13th, the wind changing from the south-east to the west point, and it became showery. On the 14th, the barometer had fallen to 29·41 inches, and a tremendous storm of thunder occurred, accompanied by heavy rain; and on the following day another violent storm of thunder took place, the wind being from the south-west; the barometer afterwards rose. On the 18th there was a third terrific storm of hail, accompanied by thunder, and the wind afterwards changed from the west to the north-west, and the following became fair. On the 20th the wind returned again to the west, and thunder and hail followed; it veered again to the north-west, and fair weather ensued. The wind returned to the south-west on the 26th, and alternate fair and wet weather followed. The barometer still ranged low, and, excepting the first four days, kept below 29 inches. The temperature has also been very irregular, the minimum varying from 41° to 48°, and the maximum from 68° to 89° Fahrenheit. Rain fell on nine days this month.

AUGUST.—A south-east wind, a low barometer, and cloudy

weather were the unfavourable aspects at the commencement of this month. The pressure continued to decrease until the 3rd, accompanied with rain and a violent thunder storm at 3 P.M.: after this storm, the barometer rose rapidly, and fair weather with an easterly wind followed, which continued without interruption until the evening of the 10th, when a shower of rain fell, and on afternoon of succeeding day rain predominated. It continued fair until the 16th, with a uniform temperature; on the latter day there were occasional showers, but the next day became fair, and remained until the 22nd, when a gloomy day and wet night again retarded the progress of the harvest; on the 23rd the wind veered to the east, and it rained nearly the whole day, but the four succeeding days were fair. Cloudy and wet weather, with a falling barometer and sinking temperature, terminated the month. Rain fell on twelve days this month.

SEPTEMBER.—The entry of this month was more propitious than the exit of the last month; but a low pressure, falling temperature, and westerly wind were discouraging aspects to the meteorologist: showers of rain, and a gloomy atmosphere prevailed until the 5th, when it became calm and fair; the barometer, however, by its unsettled state, indicated the near approach of rain, which fell abundantly until the 12th, when it became fair, and the barometer rose. This was but of short duration; on the following day the barometer sunk to 28·84 inches, and there were occasional showers. From the 14th until the end of the month the days were characterized by alternations of clouds and sunshine, with a steady barometer, and the wind blowing from the north-east quarter. The temperature this month has been uniformly steady, and rain fell on ten days.

OCTOBER.—The month entered with no favourable aspect, and during the former and latter part of the month there were wet and fair days in alternate succession; the middle of the month was remarkably fair. On the whole this has been the most regular month this year; the barometer has been very steady, excepting the latter part of the month, when it fell below 29 inches, accompanied with a south-west wind and continued rain. The temperature has also been very regular; from the 12th to the end of the month the minimum temperature has been at or below the freezing point. South-west winds have generally prevailed, and on twelve days it has rained.

NOVEMBER.—This month entered, dressed in its usual habiliments, as though it mourned the departure of the summer sky. The pressure

was unusually low, and the barometer reached its minimum of the year on the 1st, at 8 A.M., marking 28·68 inches, with a minimum temperature of 27° Fahrenheit. The wind changed to the north-east on the 2nd, and the barometer and thermometer rose gradually until the 7th, when the former instrument indicated 30·20 inches atmospheric pressure, and the latter sunk to 26°; the wind veered to the south-west again at P.M.; on the following day the barometer had fallen three-tenths, and it became cloudy. Alternations of wet and gloom, with but little fair weather, continued until the end of the month; north-west winds prevailed, without a single exception, at A.M., and south-west or westerly winds at P.M. The temperature has been uniform through the month: on the 16th, the minimum temperature marked 22° Fahrenheit. Rain fell on nine days this month.

DECEMBER.—Unlike the three preceding months, the last month of the year was ushered in with mild and fair weather, and a high barometer: such acceptable weather at this season of the year did not, however, long continue; on the 3d, a gloomy sky spread over the surrounding country, the prevalence of a south-west wind intimated a continuance of the dreary and wintry scene; it continued until the 9th, when it rained, and the two following days were succeeded by fair weather, with a south-easterly wind. On the 12th, rain again fell; the next day the wind shifted to the north, accompanied with a sharp frost, the thermometer falling to 17° in the night, and on the following night to 24°. The wind returned to the south-west on the morning of the 15th, and gloomy and wet weather, with but two exceptions, prevailed until the end of the month. From the prevalence of south-westerly winds, the barometer has been greatly depressed this month, while the temperature on the contrary has been unusual for the season, especially the last seven days, when the minimum temperature did not sink lower than 41° Fahr. There were seven days this month on which rain fell, which are but few, if we consider the prevalence of the winds from the south-west, and a mild temperature.

RETROSPECT FOR 1837, AT THETFORD, NORFOLK.

JANUARY. — The new year commenced with windy and frosty weather: the barometer at the beginning of the month stood remarkably high, and continued to fall gradually until the morning of the 6th, when a strong wind set in from the south and south-west points, accompanied with heavy rain. This unpleasant weather prevailed until the 14th. Snow and fog followed: the barometer kept unusually high, although the wind was from the south and west quarters. On the 25th, the wind veered to the north-east, and cold, rain, snow, and sleet continued until the end of the month. In consequence of the successive rain, there was a considerable flood in the neighbourhood of Thetford.

The month of January was remarkable for the prevalence of a peculiar epidemic of a more general nature than has occurred within the memory of the oldest inhabitant. The disease (influenza) attacked persons of every age and class, commencing with cold chills, violent cough, severe soreness of the muscles concerned in respiration, the pulse was soft and natural in frequency; and these symptoms were accompanied by the greatest prostration of strength and a sense of suffocation. The victims to its fatal attacks were principally among aged and young persons.

In comparing this month with the corresponding month in preceding years, the maximum temperature has been lower than in 1834–5–6, and the minimum has been one degree higher than in last year, but the range has been less than in 1834–5–6. The maximum pressure was lower than in the two preceding years, but the minimum was higher than in the last two years, and the range less than in 1833–4–5–6.

The annexed table contains the maxima, minima, and range of temperature, pressure, &c., in the month of January, for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c., in the Month of JANUARY, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in inc. and dec.	Day of the Month.	Min. in inc. and dec.	Day of the Month.	Range in inches.	Mean.	No. of Days Windy.	Direction.	No. of Days a Gale.	Direction.	No. of Days Stormy.	Direction.
1817	53°	23	25°	8	28°	..	30·60	10	29·20	17	1·40	..	3	S. W. SW.	..	..	4	S. SW.
1818	56	15	24	1	32	..	30·60	19	29·10	30	1·50	..	13	SW.	3	S. SW. S.	..	..
1819	54	14	27	31	27	..	30·60	1, 2	29·35	25	1·25	..	11	SW. S.	1	SW.	1	S.
1820	51	27	7	14	44	..	30·86	9	28·90	19	1·76	..	1	E.	..	..	..	..
1821	56	31	25	2	31	..	31·10	23	29·04	9	2·06	..	6	N. NW.	..	..	..	..
1822	49	13	25	16	24	..	30·60	22	29·45	3	1·25	..	10	SW.	8	NW. SW.	..	..
1823	48	30	9	19	39	..	30·30	8	29·30	29	1·00	..	6	E. NE.	5	NE.	..	..
1824	54	26	25	16	29	..	30·60	16	28·75	23	1·85	..	6	S.	..	..	..	..
1825	50	4	28	5	22	..	30·70	10	29·15	18	1·55	..	5	SW.	2	S. SW.	..	..
1826	47	31	15	16	32	30·5	30·50	17	29·53	11	0·97	30·02	4	N.	..	..	..	..
1827	51	14	11	3	40	31	30·15	19	29·10	14	1·05	29·62	12	S. NE. SW.	..	..	..	..
1828	54	18, 20	23·5	10	31·5	38·7	29·85	28	28·70	13	1·15	29·27	5	S. SW.	1	W.	..	..
1829	45	20	20	23, 26	25	32·5	30·10	31	29 15	26, 27	0·95	29·62	8	E. N.	..	..	..	..
1830	40	17	12	17	28	26	30·57	1	28·45	20	2·12	29·51	8	NW. W.	1	NW.	..	..
1831	47	22	22	30	25	33·5	30·45	7	29·12	21	1·33	29·67	2	S.	..	..	..	..
1832	45	11	24	4	21	35·2	30·30	15	29·25	7	1·05	29·77	4	SW. W. S.	..	..	..	..
1833	43	3	20	22	23	31·5	30·45	8	29·10	29	1·35	29·77	1	SW.	..	..	..	..
1834	56	23	29	2	28	42·5	30·00	2, 29	28·75	9	1·55	29·35	12	SW.	..	..	1	SW.
1835	52	29	20	17	32	36	30·85	2	29·00	14	1·85	29·92	5	SW.	..	..	..	..
1836	52	23	21	1	31	36	30·60	2	29·00	29	1·60	29·80	16	SW.	1	S.	..	..
1837	49	23	22	1	27	..	30·50	1	29·30	21, 22	1·20	..	15	S. NE.	..	..	..	..

FEBRUARY.—During the early part of the month it was remarkably fine, with a high barometer, and the wind blowing chiefly from the south-east. On the 10th and 11th the barometer sank to its greatest depression, and the wind changed to the south, accompanied with a strong breeze and some showers. On the 14th, the mercury in the barometer began to rise, and continued to do so until the 18th. During this period we had fair weather and a windy atmosphere. From the 18th to the end of the month, the barometer constantly fluctuated and many showers of rain were experienced; towards the end of the month there was much snow.

The temperature was comparatively mild at the beginning of the month, but continued to fall until the 6th, when it reached the minimum of the month. It remained nearly uniform until the end of the month.

The epidemic mentioned last month continues with the same characteristics, and may, perhaps, be considered as an adynamic congestion of the pulmonary system. This remark appears to be borne out by the mode of treatment adopted in different parts of the kingdom—the treatment being the reverse of such as are of an inflammatory nature. Many cases of rheumatism came under notice; some of the patients had been previously attacked with the epidemic, and therefore required great vigilance on the part of the practitioner. Sore throats and hooping-cough have been prevalent; from the severity of the latter, many children have died.

In comparing this with the corresponding month in previous years, the maximum temperature will be observed to have been three degrees higher than in 1836, the same as in 1832, but lower than in 1830–1–3–4–5. The minimum temperature has been five degrees higher than in 1836, and one degree lower than in 1835; and the range has been less than in the thirteen preceding years, excepting 1833, when it was 23°. The mean temperature has been 0°·62 more than in 1836, but less than in the ten preceding years. The maximum pressure has been less than in the previous year, and the same as in 1835. The minimum pressure has been less than in the four preceding years, and the same as in 1832. The range has been less than in 1836, but greater than in 1835. The mean has been also less than in 1834–5–6. The number of windy days has exceeded those of the thirteen previous years.

The annexed table contains the maxima, minima, and range of temperature, pressure, &c., in the month of February, for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c. in the Month of FEBRUARY, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the month.	Min.	Day of the month.	Range.	Mean.	Max. in in. and dec.	Day of the month.	Min. in in. and dec.	Day of the month.	Range in inches.	Mean.	No. of days Windy.	Direction.	No. of days a Gale.	Direction.	No. of days Stormy.	Direction.
1817	63°	6	33°	1,11,14	30°	..	30·80	1	29·60	27	1·20	..	4	SW.	1	S.	4	W. WSW.
1818	54	25	19	3	25	..	30·48	7	29·15	2	1·25	..	6	SE. W.	1	S. SW.	1	S.
1819	62	11	23	2	39	..	30·30	8	29·20	21	1·10	..	16	SW.	..	..	..	..
1820	54	23	20	17	34	..	30·47	15	29·30	24	1·17	..	6	SW. N.	..	..	..	..
1821	56	1	22	19	34	..	30·95	6	29·45	28	1·50	..	10	SW. W.	..	..	..	..
1822	55	24, 25	24	27, 28	31	..	30·85	27	29·30	5	1·55	..	14	S. SW.	8	S.	..	..
1823	48·5	12	27	3, 4	20·5	..	30·36	16	28·76	2	1·60	..	18	S. SW.	3	S. SW.	..	..
1824	55	8	25	2	30	..	30·56	9	29·00	13	1·56	..	1	SE.	..	..	..	..
1825	53	19	29	4, 27	24	..	30·40	11	29·30	3	1·10	..	3	SW. W.	1	S. SW.	..	..
1826	56	22	31	8	25	42°·5	30·30	26	29·30	17	1·00	29·80	10	S. SW.	1	SE.	..	..
1827	54	27	12	19	42	33	30·50	3	29·40	28	1·10	29·95	4	N. NE.	1	S.	..	..
1828	57	26, 27	26	11	31	41 5	30·55	3	29·10	21	1.45	29.82	3	SW. SE.	..	..	..	..
1829	51	16	18	2	33	34·5	30·55	2	29·10	21	1·45	29·82	1	SW. SE.	..	..	..	..
1830	56	25	18	5	38	37	30·25	15	29·30	21	0·95	29·77	14	SE.NW.SW	..	..	..	..
1831	60	9	23	2	37	41·5	30·25	23	28·95	3	1·30	29·60	11	NW.W.NW	..	..	..	..
1832	53	5	24	14	29	38·25	30·30	10	29·10	2	1·20	29·70	2	S.	..	..	..	..
1833	54	5, 8	31	15	23	42·5	29·50	10	28·50	2	1·00	29·25	15	SW. NE.	1	S.	..	..
1834	57	27	25	9	32	41	30·15	28	29·30	12	0·85	29·75	4	SW.	..	..	..	..
1835	55	2, 17	30	8	25	42	30·40	4, 10	29·15	22	1·25	29·75	14	W. SW.	1	S.	..	..
1836	50	9	24	19	26	35	30·45	15	28·75	2	1·70	29·60	10	SW.	1	NW.	..	..
1837	53	16	29	6	24	35·62	30·40	3 to 6	29·10	11	1·30	29·55	16	S. SW.	2	SW.	..	..

March.—Strong winds have not been so prevalent this month, as they are in general; on the contrary, the month may be said to have been a very dull one, raining nearly half the month, and the air very cold. From the 1st to the 5th, the barometer continued to fall, attended with a strong wind from the north and west points, and accompanied with storms of hail. On the 9th, the depression of the barometer increased with a south-westerly wind, and wet weather prevailed until the 13th, when a gale set in from the south, and it continued fair until the 18th, when it rained all day, the barometer sinking to 29·20 inches. The barometer again rose and continued steady until the end of the month. Much snow fell on the 20th and 26th.

The thermometric range has been very dissimilar to the range of the thermometer in the corresponding months of previous years; presenting more the appearance of the range of a winter than of a vernal month. Vegetation and fruit trees are very backward, the latter greatly injured, and the foliage but little advanced. The same remarks will apply to the crops, &c.

Very few cases of influenza came under notice, and these probably continue on account of the cold and fickle state of the weather. In many persons the influenza left an aptitude to disease; this circumstance may account for the unusual severity of those inflammatory complaints which began to shew themselves at this season of the year. Pneumonia and pleuritis have occurred; the cases were severe in consequence of the system being greatly debilitated from the influenza. Pectoral complaints were general among children. Coughs, catarrhal fevers, sore throats, &c. have been very prevalent.

In comparing this month with the corresponding month in past years, we shall perceive that the maximum temperature was considerably lower than in the twenty preceding years; the minimum was two degrees higher than in 1836, but lower than in 1834–5, and the same as in 1829. The range of temperature has been one-third less than in the last twenty years. The maximum pressure has been greater than in 1836, less than in 1835; but more than in 1831–2–3–4. The minimum pressure has been lower than in the two preceding years, but less than 1835; the range has been less than in the four preceding years. The prevalence of the south-west winds has been less than in 1834–5–6.

The annexed table shews the maxima, minima, and range of temperature, pressure, &c. in the month of March for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c., in the Month of MARCH, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in inc. and dec.	Day of the Month.	Min. in inc. and dec.	Day of the Month.	Range in inches.	Mean.	No. of Days Windy.	Direction.	No. of Days a Gale.	Direction.	No. of Days Stormy.	Direction.
1817	57°	29	22°	22	35°	..	30·65	26, 31	29·10	3, 6	1·50	..	8	NW. SW.	1	WSW.	7	WSW. W.
1818	55	18, 20	29	9	26	..	30·50	28, 31	28·90	7, 12	1·60	..	13	SW.	1	S.	..	..
1819	66	31	33	2,17,22	33	..	30·43	13, 14	29·49	1	0·94	..	7	W. NW.	..	..	..	..
1820	62	29	24	4	38	..	30·50	18	29·00	2, 24	1·50	..	7	NW.	..	..	2	NW.
1821	60	11	29	5	31	..	30·53	15	29·20	19	1·33	..	14	SW. S.	3	WSW.	..	..
1822	68	28	29·5	1	39·5	..	30·56	18	29·45	8	1·11	..	10	SW. S.	14	S. SW.	..	..
1823	57	31	26	6	31	..	30·55	15	29·05	7	1·50	..	10	SW. S.	..	..	..	..
1824	59	18	24	31	35	..	30·20	18, 20	28·80	3	1·40	..	3	S. NW.	7	NW. S.	..	..
1825	55	10	24	16, 17	31	..	30·53	20	29·00	1	1·53	..	2	NNE.	..	..	..	..
1826	63	9, 10	34	5, 12	29	..	30·40	12	29·45	23	0·95	..	4	SSE. W.	..	..	..	..
1827	58	23	32	15	26	45°	30·20	19	28·80	4	1·40	29·50	21	S. SW.	2	SW.	..	..
1828	61	15	30	6	31	43·5	30·46	15	29·05	21	1·41	29·75	4	W. NW.	5	W. SW. S.	..	..
1829	61	20	28	14	37	42·5	30·30	3	29·30	30, 31	1·00	29·65	3	S. SW. E.	..	..	..	..
1830	65	26, 30	30	5	35	47·5	30·55	27	29·40	15	1·15	29·97	11	SW. S.	..	..	..	..
1831	60	17	32	23	28	46·	30·40	31	29·05	9	1·35	29·70	12	SW. N.	..	..	..	..
1832	59	22	30	8, 9	29	44·5	30·20	10	29·15	6	1·05	29·67	11	S. SW.	..	..	..	..
1833	55	3	26	13	29	40·5	30·10	8	28·70	1	1·30	29·40	7	NE. NW.	1	SW.	..	..
1834	61	9	32	18	29	46·5	30·25	18	29·10	25	1·15	29·67	16	S. SW. NW.	1	W.	..	..
1835	55	7	32	1	23	44·	30·60	25	28·80	7	1·80	29.70	9	SW.	2	SW.	..	..
1836	60	20	26	14	34	48·	30·40	18	28·80	28	1·60	29·60	14	SW. W.	3	S. W.	..	..
1837	45	4, 9	28	26	17	..	33·45	1	29·35	10, 11	1·10	..	7	NE. SW.	..	..	..	..

April.—This month we had an unusual continuance of north and north-westerly winds. Although the barometer kept above 29·50 inches, the range of fluctuation was greater than in the last month. More snow and hail-storms have occurred than is usual at this season of the year.

The face of nature continued unveiled as in the preceding month. The foliage did not expand until the last few days of the month, and excepting in warm and sheltered situations, primroses were not to be seen. The barley, &c. are still backward.

The cold winds and frequent showers have occasioned inflammation of the chest in children, and this in addition to the hooping cough, has caused great mortality among them. Pneumonia and pleuritis have been prevalent, and some cases of fever were of a protracted nature. A few cases of influenza are still under treatment, but appear of a mild character, and the patients recover much sooner. Rubrola, scarlatina, and putussis are the prevailing epidemics, and these chiefly in children.

In comparing the temperature of this month with the corresponding month of former years, the maximum temperature was two degrees higher than in 1836, and three degrees higher than in 1829 : with these exceptions it has been lower than in the twenty preceding years. The minimum temperature was lower than in the last six years, and the same as in 1830. The mean of the thermometer is considerably less than in the eleven preceding years : the range has been greater than in 1836, but less than in 1835. The maximum pressure was one-tenth of an inch higher than in 1836, and one-tenth of an inch lower than 1835. The minimum pressure was three-tenths higher than in 1836, but much lower than in the three preceding years. The barometric range has, with the exception of 1827, been less than in the last twenty years. North-westerly and north-easterly winds have been more prevalent than in the last twelve years.

It is now eight years since a gale of wind occurred in this month, and sixteen years since a storm.

The annexed table shews the maxima, minima and range of temperature, pressure, &c. in the month of April for twenty-one years.

Table of the Maxima, Minima and Range of Temperature, Pressure, &c. in the Month of April, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in in. and dec.	Day of the Month.	Min. in in. and dec.	Day of the Month.	Range.	Mean.	No. of days Windy.	Direction.	No. of days a Gale.	Direction.	No. of days Stormy.	Direction.
1817	69°	15	31°	11	38°	..	30·74	1	29 90	16	0·84	..	7	NW. N.	..	..	..	..
1818	66	27	30	4	36	..	30·60	3, 4	29·40	6	1.20	..	7	NE. E.	1	SW.	..	..
1819	67	1	33	5	34	..	30·42	28	29·52	16	0·90	..	7	SW. ENE.	..	..	..	..
1820	69	18, 19	34	6	35	..	30·65	23, 24	29·30	9	1·35	..	7	NW. E.	1	SW.	..	..
1821	81	26	38	16	43	..	30·36	8	29·49	3	0·87	..	8	SW.	3	SW. S.	1	S.
1822	66	30	30	7, 8	36	..	30·53	2	29·50	22	1·03	..	11	S. NE. NW.	1	S.	..	..
1823	63	17	30	21	33	..	30·55	30	29·15	5	1·40	..	10	SW. W.	..	..	..	..
1824	71	30	29	4	42	..	30·40	6	28·95	1	1·45	..	5	NE. NW.	..	..	..	..
1825	65	15, 16, 23	30	1, 8	35	..	30·40	1	29·10	27	1·30	..	10	SW. NW.	..	..	..	..
1826	68	9, 10	32	28	36	50°·0	30·20	1	29·00	12	1·20	29·60	7	SW. N.W.	3	SW.	..	..
1827	75	30	28	24	47	51·5	30·30	8	29·53	24	0·77	29·93	4	SW. NE.	..	..	..	..
1828	73	29	36	1	37	54·5	30·45	30	29·40	8	1·05	29 93	9	WSW.	..	..	..	..
1829	59	12, 18	33	2	26	46	30·15	26	29·10	28	1·05	29·63	8	NW. W.	1	S.	..	..
1830	72	30	30	4	42	50·75	30·25	27	29·10	24	1·15	29·67	10	SSW.	..	..	..	..
1831	68	13	40	3	28	54	30·40	1	29·15	8	1·25	29·77	1	W.	..	..	..	..
1832	66	5, 24	39	8	27	52·5	30·40	4	29·20	29	1·20	29·80	8	SW. S. NW.	..	..	..	..
1833	68	27	35	16	33	56·5	30·05	25	28·75	1	1·30	29·40	6	NW. W.	..	..	..	..
1834	65	28, 29	35	18	30	50	30·10	15	29·90	28	0·20	30·00	..	..	..	..	..	..
1835	66	2	32	16	34	49	30·50	20	29·60	27	0·90	29·05	10	SW. NW.	..	..	..	..
1836	60	5, 22	32	1	28	46	30·30	4	29·10	8	1·20	29·70	16	NW. W. SW.	..	..	..	..
1837	62	..	30	9	32	30	30·40	7	29·40	29	1·00	..	15	NW.NE.SW.	..	..	..	..

MAY.—The range of the barometer this month has been more uniform, and the fluctuation less than in the previous month: northerly winds have prevailed, and from this circumstance the barometer has kept high. The weather, however, has been very cloudy: on the 9th, several severe hail-storms were experienced, accompanied with thunder, causing much damage in some places.

The temperature has been very unlike the month of May: this year there has been but little difference between the temperature of the day and night. Indeed the first week was comparatively wintry: our domestic fires were continued. Vegetation is still very backward.

The diseases of the month were chiefly catarrhal affections amongst those previously disposed by past attacks of influenza; in some cases much inflammatory symptoms presented themselves, affecting the mucous membrane of the mouth and air passages, and requiring very active treatment. Several cases of pleuritis of a severe kind came under notice; many cases of influenza occurred among the higher classes. Rheumatism and sore throats have been prevalent: a few cases of common fever came under notice.

The maximum temperature of this month compared with the corresponding month in former years has been lower than in the twenty past years: the minimum has approached nearer the amount of former years, but was three degrees less than in 1836, and one degree more than in 1835. The range of temperature has been the same as in 1828, and, with this exception, less than in the twenty years past. The maximum pressure has been greater than in the six years preceding, excepting 1836, when it stood above two-tenths higher. The minimum pressure was six-tenths lower than in the last year, but 0·05 higher than in 1834, and with the latter exception lower than in past years. The range of the barometer has been more than in the twenty years preceding 1837.

North and north-westerly winds have been more prevalent than in former years: in the last twenty years not a gale has occurred in this month, and but one stormy day happened during this long period.

The annexed table contains the maxima, minima, and range of temperature, pressure, &c. in the month of May for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c., in the Month of MAY, for 21 Years inclusive.

Year	TEMPERATURE.						PRESSURE.						WIND.					
		Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in in. and dec.	Day of the Month.	Min. in in. and dec.	Day of the Month.	Range in inches.	Mean.	No. of days Windy.	Direction.	No. of Days a Gale.	Direction.	No. of days Stormy.	Direction.
1817	71°	18	40°	14	31°	..	30·55	7	29·50	12	1·05	..	9	WNW.WSW.	..	..	..	..
1818	74	31	40	30	34	..	30·60	24, 25	29·50	6	1·10	..	7	SW. S. N.	..	..	..	..
1819	76	12	33	29	43	..	30·38	10	29·72	4	0·66	..	8	E. W. SW.	..	..	..	..
1820	83	24	33	5	50	..	30·45	4, 21	29·35	18	1·10	..	9	SW. S.	..	..	..	..
1821	79	5	40	22, 26	39	..	30·43	19	29·34	15	1·09	..	27	SW.WSW.N.	..	..	..	..
1822	76	19, 20, 21	40	1, 10	36	..	30·55	22	29·50	10	1·05	..	9	NE. N. E.	..	..	..	..
1823	81	7	35	4	46	..	30·55	3	29·60	12	0·95	..	15	SW. SE. S.	..	..	..	..
1824	74	31	34	20	40	..	30·55	27	29·35	15	1·20	..	1	NE.	..	..	..	..
1825	77	23	37	17	40	..	30·40	20	29·55	25	0·85	..	13	S. N.	..	..	..	..
1826	74	19	35	1	39	54°5	30·25	13	29·70	20	0·55	29·97	3	E. N.	..	..	..	..
1827	73	30	37	8	36	55	30·10	12, 21	29·30	6	0·80	29·70	6	SW.	..	..	..	..
1828	74	27	46	12	28	60	30·45	1	29·60	24	0·85	29·57	15	SE. E.	..	..	..	..
1829	75	23	42	7	33	58·1	30·45	26	29·60	1	0·85	29·57	11	NE. E. W. S.	..	..	..	..
1830	75	7, 17	43	10, 14	32	59	30·25	16	29·25	9	1·00	29·75	4	E. S. N.	..	..	1	NE.
1831	73	25	35	6	38	54	30·25	9	29·35	1	0·90	29·80	4	SE. E. SW.	..	..	..	..
1832	74	7, 25	40	9, 13	34	57	30·20	24	29·15	1	1·05	29·67	9	NW. S.	..	..	..	..
1833	83	17	48	1	35	60·5	30·30	6	29·30	2	1·00	29·85	9	S. NW. SW.	..	..	..	..
1834	78	3	46	18	32	62	30·20	21	29·00	18	1·20	29·60	9	SW. NE.	..	..	..	..
1835	71	9, 24	38	14	33	54·5	30·35	20	29·40	25	0·95	29·87	12	NW. S. SW.	..	..	..	..
1836	73	18	42	1	31	56	30·65	17	29·75	4	0·90	30·20	11	NE. E.	..	..	..	..
1837	67	17	39	9	28	..	30·43	16	29·05	19	1·38	..	11	N. NW.	..	..	..	..

JUNE.—North-westerly winds and a low temperature introduced the month of June, and alternations of fair and cloudy weather prevailed until the middle of the month, when it became fair, and connued so until the end of the month. The barometer has been steady, the fluctuations but little, and ranging high. There was but little wind. The first weeks were showery, and proved very beneficial to the stunted grasses, &c. The vegetation rapidly progressed in consequence of the increased warmth, and the most luxuriant crops have been produced. The thunder storms have been light.

The temperature of the month has been very unsteady during the former and latter part of the month, and ranged low.

Some few cases of influenza came under notice of somewhat severe kind, and occurring in those who had previously undergone it favourably. It left great prostration of strength, and some asthmatic tendency. Pleuritis, pneumonia, cynanchi tonsillaris, and rheumatitis, have been prevalent.

The maximum thermometer of this month, compared with former years, presents a remarkable diminution of temperature, and was lower than in any corresponding month of the last twenty years. In 1820 and in 1826 the thermometer rose to 91°, but in 1837 it did not rise higher than 74° Fahr. The minimum temperature was the same as in 1833, five degrees less than in 1836, and three degrees higher than in 1835. The range of temperature has been less than in the twenty previous years, excepting 1832, when it ranged two degrees less, and but nearly half of the amount of range in 1820. The maximum pressure was greater than in 1836, less than in 1835, and the same as in 1822. The minimum pressure was higher than in the ten preceding years; the range was less than in the same number of years, and only one-half the amount of range in 1835.

Strong north-easterly winds have been more prevalent in 1837 than in the fifteen preceding years.

The annexed table shews the maxima, minima, and range of temperature, pressure, &c. in the month of June, for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c., in the Month of JUNE, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in inc. and dec.	Day of the Month.	Min. in inc. and dec.	Day of the Month.	Range in inches.	Mean.	No. of Days Windy.	Direction.	No. of Days a Gale.	Direction.	No. of Days Stormy.	Direction.
1817	87°	20, 21, 25	44°	10	43°	..	30·60	10	29·50	14	1·10	..	5	SW. S. N.	1	SSW.	1	WSW.
1818	86	12, 13, 16	48	20	38	..	30·55	5, 6, 8	29·80	20	0·75	..	10	NE. SW.	..	..	..	..
1819	80	9	45	12	35	..	30·37	20	29·78	8	0·59	..	9	SW. S.	..	..	..	..
1820	91	28	42	12	49	..	30·56	26, 27	29·60	1	0·96	..	4	SW. S.	..	..	..	..
1821	86	10	42	20	44	..	30·47	10	29·85	15	0·62	..	7	NE. S.	..	..	2	NE. S.
1822	75	1, 2	40	4	35	..	30·40	16, 17	29·35	27	1·05	..	6	SW.S.NW.	..	..	..	..
1823	80	13	47	5	33	..	30·33	28	29·55	16	0·98	..	15	SW. S.	.	..	..	..
1824	76	28, 29	37	12	39	..	30·30	2, 3	29·25	15	1·05	..	2	E. S.	..	..	..	..
1825	80	12	39	5	41	..	30·55	14, 15	29·23	4	1·32	..	8	S. SW. N.	..	..	..	..
1826	91	28	49	2	42	70	30·45	23	29·90	1, 2	0·55	30·17	4	N. SW. E.	..	..	..	..
1827	79	17, 18	42	6	37	60·5	30·30	9	29·50	2	0·80	29·90	13	SW.W.NE.	..	..	..	..
1828	81	26, 27	53	5, 6, 7	28	67	30·47	26	29·35	5	1·12	29·92	7	SW.W.S.E.	..	..	..	..
1829	81	14	45	6	36	63	30·45	10	29·45	28	1·00	30·00	8	W. N.	..	..	..	..
1830	75	27	47	14	28	61	30·15	2	29·35	22	0·80	29·72	5	S. NW.	..	..	1	NE.
1831	79	19, 22	47	2	32	65	30·15	22, 23	29·55	11	0·80	29·85	4	NW. S.	..	..	..	..
1832	78	19	54	7, 10	24	66	30·30	30	29·35	5	0·95	29·82	6	SW. S. W.	..	..	..	..
1833	81	10	48	14	33	64·5	30·05	9	29·15	14	0·90	29·65	12	SE. SW.	1	SW.	1	SW.
1834	86·5	21	51	5	35·5	68·7	30·10	30	29·30	16	0·80	29·70	6	W. S. SW.	..	..	2	S.
1835	89	11	45	27	44	67	30·45	12	29·10	24	1·35	29·77	7	NW.SW.S.	..	..	..	..
1836	82	28	53	21	29	67·5	30·35	27	29·60	8	0·75	29·97	18	SW. S.	..	..	..	..
1837	74	20, 23	48	2	26	..	30·40	22, 23	29·70	11, 12	0·70	..	6	NE. S.	..	..	..	..

JULY.—Alternations of fair and cloudy weather, and a low temperature ushered in the month. With the exception of the last week, the range of the barometer was steady, notwithstanding several windy days. The genial showers this month have been productive of good effects to the corn: a better hay-harvest has not been known at Thetford, than there was this year.

The thermometric range scarcely approaches that of a summer month,—the difference of temperature being but little between morning, noon, and evening.

This month rubrola has been experienced in a very prevalent degree, both in children and adults: several cases of secondary forms of the disease presented themselves. The disease, however, has been mild, the cough light, and congestion but trifling. Rheumatitis has been prevalent, and bowel complaints are becoming somewhat general. Three cases of consumption have terminated fatally. Two cases of hemsptysis came under treatment. Some elderly persons, who had been previously afflicted with influenza, were attacked with catarrhal affections, which proved nearly fatal from want of power to expectorate. Cynanche tonsillaris and two cases of gout complete the list of monthly atmospherical diseases.

The maximum temperature of this month is low compared with the corresponding month of previous years, and was lower than in the twenty past years, excepting 1832, when it marked the same degree of temperature. The minimum temperature, however, was higher than in the five preceding years, and the same as in 1829–30–31. The range has been less than in the twenty past years. The maximum pressure was higher this month than for the last twenty years, and the minimum less than in the two preceding years, but higher than in 1834. The range has been much greater than in the twenty previous years.

The annexed table contains the maxima, minima, and range of temperature, pressure, &c. in the month of July for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c. in the Month of JULY, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in in. and dec.	Day of the Month.	Min. in in. and dec.	Day of the Month.	Range.	Mean.	No. of days Windy.	Direction.	No. of days a Gale.	Direction.	No. of days Stormy.	Direction.
1817	76°	10, 11	50°	19	26°	..	30·30	24	29·50	15	0·80	..	12	W. S. SW.	1	S.	..	..
1818	93	24	52	8	41	..	30·56	15	30·00	12, 25	0·56	..	3	W. S. SW.	..	..	..	..
1819	88·5	4	48	21	40·5	..	30·30	24	29·50	20	0·80	..	8	NW. W. SW.	..	..	..	..
1820	84	30	46	1	38	..	30·36	1	29·45	18	0·91	..	2	W.	..	..	..	..
1821	84	18	53	11	31	..	30·60	18	29·80	1	0·80	..	13	SW. S.	..	..	..	..
1822	79	4, 11	45	13	34	..	30·35	8	29·55	12, 28	0·80	..	14	S. SW.	..	..	3	S. SW.
1823	78	20	45	3	33	..	30·20	10	29·55	23	0·65	..	19	SW. S.	..	..	..	..
1824	86	14	49	4	37	..	30·40	19	29·50	2, 3	0·90	..	5	SW.	..	..	1	SE.
1825	90	19	45	24	45	..	30·30	5	29·75	1	0·55	..	2	NW. W.	1	W.	..	..
1826	90	31	50	26	40	70°	30·30	3	29·65	21	0·65	29·97	7	SW. S.	..	..	..	..
1827	81	29	47	11, 13	34	64	30·47	5	29·70	20	0·77	30·07	12	SW. S. W.	..	..	..	..
1828	80·5	3	50	30	50·5	60·5	30·10	11	29·35	13	0·75	29·75	10	S. SW. NW.	..	..	..	..
1829	79	22	54	31	25	66·5	30·20	21 to 23	29·35	3	0·85	29·77	9	S. SW. W.	..	..	..	..
1830	88	30	54	12	34	71	30·45	28	29·35	9	1·10	29·90	10	S. SW.	..	..	..	..
1831	82	28, 29	54	24	28	68	30·30	6	29·50	12	0·80	29·90	3	SW.	..	..	1	S.
1832	78	10, 12	49	19	29	63·5	30·20	15	29·50	7	0·70	29·85	13	N. SW. W.	..	..	1	SW.
1833	82	18	50	1	32	66	30·20	30	29·35	20	0·85	29·77	12	SE. W. SW.	..	..	2	SE. W.
1834	83	16	50	10	33	66·5	30·00	1	29·15	19	0·45	29·57	6	NE. SW.	..	..	..	..
1835	82	20	44	2	38	63	30·35	22	29·80	10, 13	0·55	30·07	14	SW. NE.	..	..	..	..
1836	83	24	48	20	35	65·5	30·40	31	29·50	20	0·90	29·95	21	SW.S.W.NW.	1	SW.	..	..
1837	78	27	54	1	24	..	30·63	13, 14	29·36	30	1·27	..	11	S. W. SW.	..	..	..	..

August.—Considering the windy state of the month, the fluctuation of the barometer has been but little. Clouds and showers characterized the first five days of the month; fair weather prevailed during the middle of the month, but cloudy and wet weather concluded the month. On the 26th a thunder-storm occurred, which, though not severe at Thetford, was very destructive to property in many parts of the country: in some instances the thunder-storm proved fatal to life.

The temperature may be considered high during the former part of the month, and consequently favourable to the harvest, but the latter part was cold and showery; fires were required in our dwelling-houses! and the cold greatly retarded the harvest. On several nights severe frosts occurred. The turnip crop was remarkably good.

Diseases this month were the same as in July. Rubrola has been more prevalent than for many years past. Several cases of roscola and scarlatina came under treatment. Some families have been attacked with vaciola, but from their having been previously vaccinated its course was mild. Asthma has been very severe in persons predisposed to it, arising from the cold and wet weather. Many cases of cynanchi tonsillaris have been under observation. Rheumatism, chronic and acute, has attacked the labouring classes. Several cases of spasmodic colic and cholera morbus (from an immoderate use of fruit), came under notice, but did not require active treatment, and easily gave way to the absorbents and opium.

The maximum temperature of the month, compared with former years, may be considered lower than usual, although it was higher than in 1836; the minimum, however, is below any during the last twelve years; but the range has been greater than in the six preceding years. The maximum pressure was higher than in the last seventeen years, excepting in 1828. The minimum pressure has been lower than in the two preceding years, but the range has been greater than in the three previous years. There has been a greater number of windy days this month than in the corresponding month of the six previous years.

The annexed table contains the maxima, minima, and range of temperature, pressure, &c. in the month of August for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c., in the Month of AUGUST, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in inc. and dec.	Day of the Month.	Min. in inc. and dec.	Day of the Month.	Range in inches.	Mean.	No. of Days Windy.	Direction.	No. of Days a Gale.	Direction.	No. of Days Stormy.	Direction.
1817	76°	6, 7	41°	22	35°	..	30·34	6	29·20	26	1·14	..	16	WSW. S.	..	..	..	..
1818	87	5	47	2	40	..	30·44	11	29·80	28	0·64	..	6	N. WSW.	..	..	..	..
1819	83	1,12,24	45	31	38	..	30·50	27	29·40	30	1·10	..	5	N. S. SW.	..	..	..	..
1820	85	..	44	..	41	..	30·40	10, 11	29·10	8	1·30	..	14	S. SW. W.	..	..	..	..
1821	84	2, 5	49	18	35	..	30·43	20	29·60	10	0·83	..	5	S. W. NE.	2	S.	..	..
1822	84	22	45	2	39	..	30·40	16	29·65	29	0·75	..	12	S. SW.	1	SW.	1	SW.
1823	80	13	47	5	33	..	30·33	31	29·55	16	0·78	..	15	S. SW.	..	..	..	..
1824	80	29	46	1	34	..	30·37	26	29·45	15	0·92	..	4	SW.	..	..	2	SW.
1825	83	1	49	19, 25, 26	34	..	30·35	20	29·25	4	1·10	..	11	S. SW.	..	..	..	..
1826	86	8	50	12	36	68°	30·30	18, 19	29·70	23	0·60	30·00	11	NE. S. SW.	..	..	1	NE.
1827	81	2	47	29	34	60	30·37	6	29·30	15	1·07	29·83	8	SW. W. N.	..	..	..	..
1828	75	25	49	16	26	62	30·45	..	29·50	..	0·95	29·97	11	S.SW.NW.	1	SW.	..	..
1829	79	8	52	1, 24, 28	27	..	30·25	7	29·20	24	1·05	29·72	13	W. S. SW.	3	SW.NW.NE.	..	..
1830	80	1	47	18	33	63·5	30·20	31	29·30	28	0·90	29·75	15	SW. S.	..	..	..	..
1831	78	27	55	17	23	66·5	30·15	22	29·50	19	0·65	29·82	6	SW. NW.	..	..	..	..
1832	80	9, 10	53	25, 26	27	..	30·15	11	29·00	28	1·15	..	7	S. SE.	..	..	..	..
1833	74	9	49	31	25	61·5	30·15	1	28·40	30	1·95	29·27	8	N. S. W.	1	N.	2	W.
1834	83	13	52	25, 27	31	66	29·85	16	29·20	24	0·65	29·52	3	SW. S.	..	..	..	..
1835	83	11	56	30	27	69·5	30·35	9	29·60	24	0·75	29·97	10	SW. S. NE.	..	..	..	..
1836	74	5	50	29	24	62	30·40	11, 12	29·65	22	0·75	30·02	11	W.NW.SW	..	..	..	..
1837	77	16	46	27	31	..	30·45	8	29·40	29	1·05	..	14	S. E. SW.	..	..	..	..

SEPTEMBER.—The windy and showery state of this month may account for the great variations in the barometric column. At the commencement of the month the barometer was very low; it rained for a few days and continued fickle until the 19th, after which there were several fair days with east and north-easterly winds. The last few days of the month were showery.

The temperature of the month may be considered low: the nights were cold, and some frosts were experienced early in the morning.

Vaccination has become general in consequence of the prevalence of small-pox. The disease has attacked many; even those who have been vaccinated have not escaped. Measles still continue to be prevalent. Congestion and an inflammatory state of the lungs were severe, and in a few instances proved fatal. Fevers of a protracted kind have attacked the higher and labouring classes. Rheumatitis still attacks many, affecting limb after limb, and remaining for some time. Diarrhœa and colica spasmodica became somewhat general from immoderately eating the fruit of the season.

In comparing this month with the corresponding month in previous years, the maximum temperature will be found to have been lower than the maxima of the three preceding years, but three degrees lower than in 1833. The minimum, on the contrary, was higher than the minima of the eight preceding years, but the range was less than in the past years. The maximum pressure was greater than in 1835–6, the same as in 1825, 1827, and 1832, but three-tenths lower than in 1834. The minimum was less than in the five preceding years, excepting 1833. The range was greater than in 1835 and 1836.

The annexed table contains the maxima, minima, and range of temperature, pressure, &c. in the month of September for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c., in the Month of SEPTEMBER, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in in. and dec.	Day of the Month.	Min. in in. and dec.	Day of the Month.	Range in inches.	Mean.	No. of days Windy.	Direction.	No. of days a Gale.	Direction.	No. of days Stormy.	Direction.
1817	75°	6	42°	28	33°	..	30·40	5	29·52	26	0·88	..	7	W. S. WSW.	..	..	..	..
1818	81	1	49	16	32	..	30·40	14	29·60	26	0·80	..	6	E. S. W.	..	..	..	..
1819	79·5	9	42	21	37·5	..	30·60	21	29·65	1	0·95	..	6	SW. S.	..	..	..	..
1820	75	11	33	26	42	..	30·40	9	29·50	21	0·90	..	16	S. SW. NW.	..	..	..	..
1821	80	6	42	29, 30	38	..	30·46	15	29·55	29	0·91	..	16	S. SW. W.	3	SSW. S. SW.	..	..
1822	73	6	35	30	38	..	30·45	14	29·45	24	1·00	..	23	SW. NE. N.	4	S. SW. SE.	..	..
1823	75	16	33	28	42	..	30·45	18	29.30	14	1·15	..	6	N. SW.	2	S. N.	..	..
1824	82·5	3	31	28	51·5	..	30·20	16	29·35	8	0·85	..	8	SW. S. NW.	..	..	..	..
1825	77	1	43	27	34	..	30·35	28	29·40	14	0·95	..	15	S. NW. SW.	..	..	..	..
1826	74	4	41	22	33	57·5	30·25	16	29·10	6	1·15	29·67	7	SW.	..	..	1	N.
1827	72	11	46·5	22	26·5	59·2	30·35	1	29·40	22	0·95	29·87	8	S.	..	..	..	..
1828	73	26	50	15	23	61·5	30·65	16	29·50	12	1·15	29·57	9	SW. S. SE.	..	..	1	S.
1829	68	10	41	29	27	54·5	30·20	26	29·10	13	1·10	29·65	9	S.	..	..	..	..
1830	68	2	43	30	25	55·5	30·30	27	29·15	21	1·15	29·72	6	S. SW.	1	W.	..	..
1831	70	7, 8	42	30	38	56	30·20	18	29·20	1	1·00	29·60	4	SW. S.	..	..	..	..
1832	70	29	42	19	28	56	30·35	22	29·45	1	0·90	29·80	..	..	..	..	..	..
1833	66	14	44	26	22	55	30·10	5	29·00	1	1·10	29·55	10	NW. S. E.	1	NW.	..	..
1834	75	4	44	15	31	59·5	30·65	13	29·40	7	1·25	30·02	1	S.	..	..	..	..
1835	74	4, 6	40	25	34	57	30·30	2	29·25	10	1·05	29·77	4	S. SE.	7	S. SW.	..	..
1836	70	1	44	30	26	57	30·30	21	29·35	6	0·95	29·82	16	SW.	..	..	..	..
1837	69	9	45	1, 2	24	..	30·35	25, 24	29·16	13	1·19	..	16	S. SW. E.	..	..	..	..

October.—Rain ushered in the month: alternations of cloudy and fair weather characterized the tenth month. The first occurrence of fog this year was on the morning of the 13th, and three following days. The range of the barometer was high, and, indeed, higher than at any period during the year, and the weather continued fair until the 22nd. Showery and windy weather prevailed until the end of the month, accompanied with a falling barometer.

The temperature has been mild, but some nights were excessively cold. Towards the end of the month the temperature decreased, and announced the near approach of winter. Sleet fell on the 31st.

Diseases were not so numerous as they usually are at this season of the year, owing probably to the fair state of the atmosphere. Small-pox still continues gradually to insinuate itself among those unprotected by vaccination. To show the prophylactic powers of vaccination, it need only be stated, that on account of some members of a family being affected with small pox, the other branches of the family were immediately vaccinated, and thus escaped its contagion. In other parts of the town similar instances are recorded. Measles still continue; but of so mild a nature as to require but little attention. The most indigent of the poor have been attacked with fevers of a common kind, arising from the vicissitudes of the season. Some cases of diarrhœa came under notice of a severe kind, and occasioning great prostration of power; they were, however, overcome by absorbent and anodyne medicines.

The maximum temperature of this month was higher than in the corresponding month in 1835, and the minimum was also higher than in 1834–5–6; the range has been less than in the last-mentioned years. The maximum pressure was greater this month than in the last sixteen years, except 1833–4; the minimum was higher than in the three previous years; but the range has been less than in the four previous years, and the same as in 1827.

The annexed table shows the maxima, minima, and range of temperature, pressure, &c. in the month of October, for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c., in the Month of OCTOBER, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in in. and dec.	Day of the month.	Min. in in. and dec.	Day of the Month.	Range in inches.	Mean.	No. of Days Windy.	Direction.	No. of Days a Gale.	Direction.	No. of Days Stormy.	Direction.
1817	59°·5	1	32°	2	27°·5	..	30·50	6, 7	29·40	30	1·10	..	14	NE. N. S.	..	..	..	..
1818	70	16	32	12	38	..	30·50	29, 30	29·40	6	1·10	..	4	S. SW.	..	..	..	..
1819	74	11	31	25	53	..	30·42	15	29·40	24	1·02	..	7	NW. N.	..	..	..	..
1820	62	15	33	20	29	..	30·70	3	28·75	22	1·95	..	7	N. S.	3	S. SW.	..	..
1821	69	3	33	22	46	..	30·60	13	29·10	20	1·50	..	5	S.	6	SW.	..	..
1822	67	4	32	27	35	..	30·30	11	29·50	17	0·80	..	19	S. SE.	2	E.	..	..
1823	65	6	33	2	32	..	30·40	26	28·80	1	1·60	..	6	NE. NW.	2	S. N.	..	..
1824	66	6, 7	28	16, 17	38	..	30·00	18, 19, 30	28·85	12	1·15	..	8	S. SW.	1	S.	1	SW.
1825	67	3	29	25	38	..	30·42	15	28·90	19	1·52	..	11	NW. SW.	..	..	..	..
1826	66	1, 2	33	5	33	49.5	30·15	14	29·40	26	0·75	..	8	S. SW.	5	S. SW.	..	..
1827	67	2	38	29	29	52·5	30·37	4	29·10	11, 22	1·27	29·75	7	N. SW.	..	..	..	..
1828	67	23	31	19, 29	36	49	30·55	28	29·30	5	1·25	29·92	4	S. SW.	3	SW. W.	..	..
1829	62	19	33	9	29	47·5	30·35	10	29·30	14	1·05	29·67	9	NW. S. SW.	..	..	..	..
1830	66	20, 1, 2	37	26, 28, 9	29	51·5	30·45	10	29·50	28	0·95	29·97	3	SW. W.	..	..	..	..
1831	70	1	42	30	28	56	30·20	18	29·20	1	1·00	29·60	4	S. SW.	..	..	..	..
1832	68	11	39	19	29	53·5	30·25	25	29·02	5, 7	1·23	29·65	6	SE. SW.	..	..	..	..
1833	63	3	38	20	25	50·5	29·95	9	28.70	15	1·25	29·32	8	S. SW.	..	..	..	..
1834	69	5	32	23	37	50·5	30·70	29	29·20	16	1·50	29·95	7	SW. NW.	..	..	..	..
1835	66	1, 3	33	19	33	49·5	30·40	15, 16	28·85	10	1·55	29·62	7	S. SW. NW.	..	..	..	..
1836	67	19	28	29	39	47·5	30·45	20	28·95	2	1·50	29·22	10	SW. SE.	1	S.	..	..
1837	68	4	37	25, 27, 8	31	..	30·63	13. 14	29·36	30	1·27	..	11	S. W. SW.	..	..	..	..

NOVEMBER.—Wet and boisterous weather introduced the eleventh month. Throughout the whole year the barometer has not been so low as it was at the commencement of this month. After the first day the mercurial column gradually rose until the 6th, when it reached its maximum height; during this period we had frosty weather, which continued until the 13th, notwithstanding the subsiding of the mercury in the tube of the barometer. On the 14th another remarkable depression of the barometer took place, attended with heavy rain and a north-west wind; a few days after this some snow fell. Until the end of the month the weather continued fickle. Upon the whole, November has been a very cloudy month.

The temperature has assumed a wintry appearance. Some nights were very frosty, but the days were mild. On the 6th, 7th, and 8th, the frosts were severe, injuring the turnips, &c.

The month of November this year may be considered very healthy. Small-pox and measles still continue, though in a mild degree; the former is much modified by vaccination. There were several cases of rheumatism among the poor, which required very active treatment. Fevers of a common kind and scarlatina were the epidemics of the month.

The maximum temperature of this month has been higher than in the corresponding month in 1835-6, but lower than in 1833-4, and the same as in 1825, 1827, 1830, and 1832; the minimum was lower than in the five preceding years, and the range greater than in the two past years. The maximum pressure was higher this year than in any year recorded in the annexed table, and one inch higher than in November 1833. The minimum was lower than in the eleven preceding years, excepting 1833, when it stood two-tenths lower; the range has consequently been much greater than in any former year, by nearly one-half the amount of range, or about one inch.

In November this year there were neither gales nor storms, as in the corresponding month of former years. The number of windy days was the same as in 1833.

The annexed table shews the maxima, minima, and range of temperature, pressure, &c. in the month of November, for twenty-one years.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c. in the Month of NOVEMBER, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in in. and dec.	Day of the Month.	Min. in in. and dec.	Day of the Month.	Range.	Mean.	No. of days Windy.	Direction.	No. of days a Gale.	Direction.	No. of days Stormy.	Direction.
1817	59°·5	7	32°	25	27°·5	..	30·60	19, 20	29·60	15	1·00	..	9	SE. SW. S.	..	..	..	..
1818	62	3	35	7	27	..	30·50	28, 29	29·50	5	1·00	..	5	SW. NE. S.	..	..	..	..
1819	54	4, 5, 6	22	23	32	..	30·25	18	29·20	21	1·05	..	4	SW. S.	1	W.	..	..
1820	67	7	26	4	41	..	30·44	29	29·40	1	1·04	..	..	..	..	..	..	..
1821	66	2	25	4	41	..	30·50	6	29·15	4	1·35	..	17	S.	6	S. SW.	..	..
1822	60	2	30	8	30	..	30·42	4	29·30	15	1·12	..	12	S. SW.	3	SW. S.	..	..
1823	54	7	25	12	29	..	30·65	10	29·40	29	1·25	..	7	NW. SW.	..	..	..	..
1824	56·5	18	28	5	28·5	..	30·05	16	28·45	23	1·60	..	11	S. SW.	2	S.	1	SE.
1825	56	1	23	12	33	..	30·15	25	28·70	29	1·45	..	11	SW.	1	S.	..	..
1826	53	3	22	27	31	37·5	30·40	21	29·00	14	1·40	29·70	17	SW. N. NW.	1	S.	..	..
1827	56	6	24	22	32	40	30·20	5, 26	29·45	29	0·75	29·62	2	NW. N.	..	..	..	..
1828	57	3	24	11	33	40·5	30·40	3	29·40	16	1·00	29·90	7	E. W. S.	..	..	..	..
1829	60	4	24	20	36	44	30·35	18, 19	29·50	22	0·85	29·92	3	SW.	1	NE.	..	..
1830	56	1, 2, 6	27	24	29	41·5	30·35	24, 25	29·00	6	1·35	29·67	5	SE. S. W.	..	..	..	..
1831	57·5	1	26·5	18	31	44	30·35	29	29·02	15	1·33	29·67	12	SW. W.	..	..	1	SW.
1832	56	1	33	16	23	..	30·25	6	29·20	2	1·05	..	5	SW. NE. W.	..	..	..	..
1833	60	1	28·5	25	32·5	44·5	29·90	18	28·50	28	1·40	29·20	10	SW.	1	W.	..	..
1834	65	7	29	26	36	47	30·40	16	29·20	29	1·20	29·80	6	S.	..	..	..	..
1835	53	22	32	6	21	42·5	30·40	10	29·20	30	1·20	29·80	7	E. SW.	1	SW.	..	..
1836	55	28, 29	31	7	25	43	30·10	20	29·15	28	0·85	29·62	17	SW. S. SE.	1	W.	1	SW.
1837	56	22	27	28	29	..	30·90	11	28·70	1	2·20	..	10	S. SW.	..	..	..	..

DECEMBER.—The year concluded in a very remarkable manner; the last month was ushered in with the appearance of spring-like weather, but the subsiding of the mercury in the tube of the barometer, intimated an approaching change from fair to wet weather. On examining the curvelinear range of the barometer, its vacillitation denotes very unequal pressure: it reached its maximum height on the 4th, after which its diurnal fall with an easterly wind predicated at this season of the year, that rain or snow would shortly occur. Snow and rain fell on the 6th and 7th. Cloudy and frosty air continued until the 12th, when the wind veered to the west; rain again fell. On the 17th, there was a strong wind from the south, accompanied with rain; the wind increased on the following day, the rain continuing to fall, and the barometer sinking rapidly; on the 19th, the gale veered to the south-west, and on the succeeding day blew a perfect hurricane, causing the barometer to sink four-tenths and a half, and accompanied with violent rain: on the next day the wind changed to the north-east, and the barometer immediately rose, and in a short time gained an elevation of 30·240 inches, or near six-tenths in about eighteen hours. This gale did considerable damage in the locality of Thetford, carrying the fencing before it, rooting up and destroying trees, &c. &c. The wind returned to the north-east on the 21st, and cloudy weather ensued: on the 24th a second gale commenced from the south, attended with warm rain; the wind reached its maximum on the following day, changing its course to the south-west; the next day it became calm, and the wind blew in a more southerly direction, with alternations of fair and misty weather, until the end of the month. Such has been the extraordinary mildness of this month, that the minimum temperature has fallen but six times below 33 , and has kept uniformly high through the month.

In comparing this month with the corresponding month in former years, it will present many remarkable facts; in 1817, the month was cold and frequently severe; in 1818, the first few days were comparatively mild, after which the temperature gradually sunk, and towards the end of the month it became excessively cold, the thermometer sinking 12° below the freezing point, and the maximum scarcely higher than 42° Fahrenheit. On referring to the register kept of the temperature in 1819, I find that so severe a December had not been experienced for many years; in 1820 alternation of temperature continued until the last week of the month, when aided by very high winds from the north, it became severely cold; in 1821 the temperature was mild, and there were but few frosty nights, and these occurring only when the wind blew from the east and north-east, in 1822 the thermometric

range was generally low, on some days the cold was intense, and towards the end of the month, the minimum temperature marked 11° below the freezing point; in 1823 the temperature was the same as in 1821; in 1824, the thermometric range was very unlike a winter month, there being but a few degrees between maxima and minima; in 1825 the temperature also was mild, and varying but little day and night, but decreased toward the end of the month, and on the 31st, fell to 19°; in 1825 it was much the same as in the two preceding years, and the midnight temperature ranged but little below that recorded at 8 P.M.

In 1832, the month was mild with but few frosty days. In 1832 the month assumed the appearance of spring, and was the same as in the year 1837. In 1834, the thermometer reached the freezing point but twice. In 1835 the range of temperature was very eccentric; after the first week severe cold followed, such as had not been experienced for many years; the thermometer varied but few degrees between maxima and minima, and on some nights the minima temperature fell to 17° Fahr. The curvelinear range in 1836 assumed a curious appearance, being highest at the beginning of the month, and gradually descending to the end, when it ranged but a few degrees above 35°, and a prodigious fall of snow took place.

The following table shews the maxima, minima and range of temperature, pressure, &c. in the month of December for twenty-one years inclusive.

TABLE of the Maxima, Minima, and Range of Temperature, Pressure, &c. in the Month of DECEMBER, for 21 Years inclusive.

Year.	TEMPERATURE.						PRESSURE.						WIND.					
	Max.	Day of the Month.	Min.	Day of the Month.	Range.	Mean.	Max. in in. and dec.	Day of the Month.	Min. in in. and dec.	Dayof the Month.	Range.	Mean.	No. of days Windy.	Direction.	No. of days a Gale.	Direction.	No. of days Stormy.	Direction.
1817	58°	1	23°	9	35°	..	30·30	26, 29	28·95	19	1·35	..	4	SW. S.	1	SW.	..	..
1818	51·5	8	20	16	31·5	..	30·70	28, 29	29·60	7	1·10	..	2	S. WSW.	..	..	..	..
1819	56	20, 21	20	7, 10	36	..	30·30	3	29·45	23	0·85	..	4	SE.	..	..	..	..
1820	55	7, 11	19	30	36	..	30·40	20	29·45	13	0·95	..	19	SW. S. NE.	..	..	1	SW.
1821	55	10, 16	28	6,11,25,6	27	..	30·45	11	28·20	25	2·25	..	9	S.	..	..	9	SE. SW.
1822	47	9	21	29, 31	26	..	30·70	12	28·85	1	1·85	..	10	SW. N.	2	SE. SW.	..	..
1823	53	1	23	19	30	..	30·35	7	28·85	17	0·50	..	7	SW. S.	3	S.	1	S.
1824	52	25, 27	27	10	25	..	30·35	14	28·60	22	1·75	..	11	SW. S.	..	..	..	..
1825	51·5	17	19	31	32·5	..	29·95	24	28·85	2	1·10	..	6	S. SE. SW.	..	..	..	..
1826	50·3	7	29	5	21·3	41	30·40	27, 28	29·05	2	1·35	29·72	6	S.	..	..	..	..
1827	55	19	28	28	27	41·5	30·30	28	28·70	1	1·60	29·50	11	SW.	..	..	..	..
1828	58	1	30	25	28	44	30·45	14	29·10	8	1·35	29·72	12	S. SW.	..	..	..	..
1829	45	5	17	27	28	31	30·55	31	29·65	18	0·90	30·10	..	..	..	..	..	..
1830	49	11	15	26	34	32	30·35	15	28·85	9	1·50	29·60	6	E. W.	..	..	..	..
1831	53	9, 10, 11	26	24	27	38·5	30·25	27, 28	28·80	7	1·45	29·52	4	S.	..	..	..	..
1832	54	1	26	27	28	40	30·20	11, 12	29·15	3	1·05	29·67	6	WSW.	1	SW.	..	..
1833	56	5	27	21	29	41·5	29·80	26	28·85	20	1·95	29·32	11	SW.	6	SW.	..	..
1834	55	7	24	23	31	39·5	30·60	11, 14, 15	29·20	1	1·40	29·90	5	S.	..	..	..	..
1835	50	1	17	25	23	33·5	30·50	23	29·40	1	1·10	29·95	9	SE. N.	..	..	..	..
1836	54	4	26	30	28	40	30·35	22	28·95	9	1·40	29·65	20	SW. NE.	2	SW.	..	..
1837	52	18,9,20,25	28	3, 9	24	..	30·50	4	29·16	20	1·34	..	2	S.	3	SW.	1	SW.

RETROSPECT OF THE YEAR 1837, AT SWANSEA, GLAMORGANSHIRE.

January.—The new year was ushered in with fair weather and a high barometer; but the month was colder than usual in the corresponding month of preceding years. The prevailing wind was east; and in consequence of the cold and chilly air, and the continuance of the wind from this quarter, much illness occurred. Alternations of fair, cloudy, and damp weather, successively attended the changes of the wind.

February.—This month entered with cloudy and gloomy weather, and continued so through the month; rainy and cloudy days alternately succeeded each other during the whole month. There was a strong gale from the south-east on the 8th, accompanied with rain. On the 14th, A.M. it was stormy, and thunder and lightning occurred. On the 18th, after a rainy day, the night cleared up, and one of the most splendid auroral displays was exhibited, such as has not been witnessed here for some time. It commenced in the south-west with streamers shooting across the firmament to the east, and continued to increase until it terminated in an arch of a rich carmine hue. This magnificent coronal display lasted, with some slight variations, until midnight. The prevailing winds this month were east, south-east, and south-south-west.

March.—This month was one of unusual severity; snow rested on the surrounding hills during the whole month, and occasionally fell in our streets. But this snow seems to have prevailed not only here, but also all over England, and on the Continent. A Roman journal, after noticing the fact of snow having fallen on the Continent, mentions that, on the 25th of March, 1595, snow also fell during the whole day. Hail and sleet, however, have not been unfrequent attendants to March in previous years, particularly when the north-east winds have prevailed. The quantity of rain that fell was small, being little more than nine-tenths of an inch. The corresponding month last year was throughout very stormy, scarcely a day passing without heavy rain, and, in consequence, nearly five inches of rain were registered. Snow and hail also occurred last year during the month, there being six days marked with hail, and three with snow. The maximum height of the thermometer in March, last year, was much below that of 1837, and the minimum this year much lower than 1836, viz. :—

Maximum of thermometer for March 1836 . .	59°
Minimum of thermometer „ „ „ . .	30
Maximum of thermometer for March 1837 . .	69
Minimum of thermometer „ „ „ . .	27

The barometer last year stood much lower, and, consequently, there appears to have been more humidity in the atmosphere. It was stormy on the 28th, and on the 30th, at 9 P.M., an aurora was visible. The prevailing wind was south-east; twenty fine clear days, with an easterly wind, are recorded in the register this month.

APRIL.—This month last year was ushered in by a heavy fall of snow, and a continuance of hard frost, for several days. This year, although not so much frost was experienced by day, yet, on the whole, the month proved a very cold and ungenial one. Hail fell on the 3rd; for a few hours on the 11th was experienced a heavy fall of snow, being the greatest quantity that fell during the year. There was thunder on the 3rd and 6th, and snow and hail fell on the 16th. On Thursday, the 20th, a magnificent and well defined total eclipse of the moon took place, at forty-eight minutes past 5 P.M. While yet below the horizon, the moon's disc immersed into the penumbra of the earth's shadow at fifty minutes past six; her contact with the dark shadow commenced about fifty-six minutes past six. The moon rose partially eclipsed on the southern limb, and a rare and highly interesting phenomenon appeared to those who were in a favourable position for observation, being similar to that which took place in Paris in 1750. On account of the refraction of the earth's atmosphere, the body of the sun was apparently above the western horizon, while the moon was above the eastern, a circumstance anomalous to our ideas, were we not acquainted with the real cause, since it is absolutely necessary that the sun should actually have set, in order to produce an eclipse of the moon when above the horizon. At fifty-one minutes past seven, the moon became totally dark, and continued so until nine, when she again became visible, but still unilluminated by the direct rays of the sun, the reason of her visibility being the effect produced by reflected light, which was so exceedingly powerful as to occasion the whole of her disc to be strongly defined. About thirty-one minutes past nine, the first rays of the solar light began to strike on her south-eastern limb. At thirty-two minutes past ten, the dark shadow had left her. She then gradually emerged from the fainter shadows of umbrageousness, and at thirty-five minutes past eleven was wholly unobscured, shining

with her wonted brilliancy, as if nothing had occurred. The period of total darkness was one hour and forty minutes—a considerable time, but it does not appear very singular when we consider that the moon had to pass through a portion of the earth's shadow exceeding in breadth her own diameter by more than one-half.

A meteor was observed on the 16th traversing from north to south, and presenting a most brilliant appearance. There was a dense fog on the evening of the 2nd.

MAY.—This month, instead of exhibiting its usual smiling joyous features, was cold and backward. Fires were to be found in our dwelling-houses, and continued even unto the first of June; until after that day we had no weather telling us of the near approach of summer. The country felt the backwardness and coldness of the season, and the crops suffered severely; the apple-trees alone proving an exception, the luxuriance of their blossom this year far surpassing anything that has been seen for many years past. The month of May last year proved a dryer one than this, and was also a very trying one to the agriculturist; dry and parching winds prevailing throughout, with nearly a total absence of rain.

JUNE.—This month proved both fine and seasonable, scarcely one-half the number of wet days occurring, as in the corresponding month last year. The thermometer was 7 degrees higher in the June of this year than it was in the preceding year, but the range for the whole month, however, was the same, and the average daily range greater than that of the same month in 1836; it being last year 9° more, and this year 12° of Fahrenheit. The maximum height of the barometer was greater than in June 1836.

JULY.—The former part of this month was characterised by very hot weather, which continued with little intermission until about the 12th, on which the hottest day occurred; rain then fell, and fine weather ensued until the night of the 28th, when we were visited by a very severe storm, commencing in the SE., and lasting through the whole of the next day and part of the night of the 29th. The very rapid fall and rise of the barometer was very remarkable on these two days. This month proved a much finer month than the corresponding month last year, and was considerably warmer. The maximum of the thermometer last year was 78°; this year it stood as high as 81°·06 on the 12th day.

AUGUST.—The early part of this month was fine and hot, the latter part of the month was not quite so propitious for the harvest. A gale of wind on the 3rd; and high winds occurred on two or three days about the middle of the month. Heavy rain and tempest on the 10th. This month was remarkable for its uniformly high temperature. The temperature of M. Chevalier's thermometer, at Paris, rose almost every day up to the 20th to 75°, 79°, 80° of Fahrenheit, and even went above 82°. On the 20th it was 15° 7-10ths of Reaumur, or 67° of Fahrenheit,—at five o'clock; at twelve o'clock, 21° 3-10ths Reaumur, or 80° Fahrenheit; at one o'clock, 22° Reaumur, or $82\frac{3}{4}°$ Fahrenheit; and at two o'clock, 22° Reaumur, or $82\frac{3}{4}°$ Fahrenheit.

SEPTEMBER.—Although this month commenced with rain and thunder, it proved on the whole remarkably fine. We were, however, visited with some stormy and gusty days, especially during the former part of the month; up to the 18th the wind kept steadily to the west, but during the remainder of the month it blew steadily from the east. From the 20th inclusive we had no rain, with the exception of the hundredth part of an inch, on the night of the 30th. The thermometer stood 12 degrees higher this year than in 1836; the minimum was lower last year, being 47°. The barometer was within a degree of the maximum of last year. For the sake of comparison, we annex the following maxima and minima:—

	Max. Therm.	Min. Therm.	Max. Barom.	Max. Hygrom.	Rain.
1836	65°·00	44°·00	30·24	60	3·34
1837	76 ·00	46 ·00	30·23	63	2·47

In this month last year, 14 rainy days occurred, and 16 this year; on the whole, however, it proved a very delightful month.

OCTOBER.—This month proved one of no small interest to the meteorologist, inasmuch as the changes were unusually remarkable. The barometer ranged from 29·27 inches to 30·60, and the thermometer from 41°·00 to 68°·09. The early part of the month up to the 21st was most delightful, having almost the appearance of a second summer. The illusion, however, passed away, and November assumed her dominion with more than ordinary violence, combining the squally periods of the equinoxes, with storms of hail, rain, thunder, and lightning, such as are rarely experienced in this locality at any season of the year. On the 4th, the unusually large quantity of 0·78 inches of rain fell; on the 24th, 0·53 inches; on the 31st, 0·49 inches; and on the 29th, 0·36 inches, making 2·16 inches in four

days:—3·92 inches of rain fell during the whole month. On the 27th, 30th, and 31st, we were visited with very severe gales of wind and frequent hail-storms; mist and fog too were frequent. The northern lights were visible on the 18th. On the 13th, a total eclipse of the moon took place, for the observance of which we fortunately had an unusually fine night. The October of 1836 was more rainy than the corresponding month this year:—4·58 inches of rain fell in 1836. The storm that took place on the 31st caused much damage.

November.—This month in every way verified the epithet gloomy, so universally applied to November; it was ushered in by storms and high winds, and rain occurred on twenty-four of the thirty days. It was tempestuous on the night and morning of the 1st, with heavy rain and hail storms on the following day. The Aurora Borealis was frequently visible, and at times particularly brilliant and beautiful: one was visible about 7h. 30m. P.M. on the 12th; on the 14th at P.M.; and again at 8h. P.M. on the 15th. Although no snow of consequence fell here, the surrounding hills were covered several times. Fog and mist prevailed. Last year there fell but 3·11 inches of rain in this month; this year we find 4·25 inches; last year there were but 19 wet days in November, and this year 24 days.

December.—The end of the year 1836 was characterised by an extremely heavy and general fall of snow. This year, however, our Christmas was a mild one, and no snow occurred during the month, excepting a few flakes on the 2nd and 3rd. The month was rather characterised by wet weather, thirteen rainy days having occurred; The maximum temperature is the same as in 1836, 59°; the minimum 30°. The maximum of the barometer was also the same as in 1836. the minimum this year was 0·32 parts of an inch above the minimum of 1836. Several days of storm and very high wind also occurred in this month, and on the whole we may say it was a dreary, wet, and stormy December.

RETROSPECT OF THE YEAR 1837 AT HIGH WYCOMBE, BUCKINGHAMSHIRE.

JANUARY.—During the last thirteen years the thermometer has never before reached to 58 degrees, and only twice in that time, viz. in 1828 and 1834, has the mean temperature been so high, and only in those years has there been so much rain and melted snow. This proves that humidity and warmth attend each other even at this season of the year. The range of the barometer was small, and the mean was very nearly the same as in the corresponding month of last year; the extreme of cold happened on the night of the 1st, as it did on the night of the 1st of January last year. Snow fell on five different days, but the whole quantity was very little; but once covering the ground to the depth of a quarter of an inch, which soon melted away. At 10 P.M. on the 23rd, the thermometer, which stood at 51°, at 3 P.M., had risen to 58°, when the whole atmosphere had the appearance of steam; the minimum of the night was 47°.

FEBRUARY.—This was the warmest February that has occurred during the last thirteen years, although the maximum was not so high as in the corresponding months in 1828 and 1831; but the range was nearly thirty degrees. The mean of the barometer was higher than usual for the month, although the maximum was lower than the average. Snow fell on the night of the 26th and morning of the 27th, but did not lie long on the ground, which was only partially covered. The quantity of rain and melted snow has been exceeded only four times in the same month in the period before mentioned. On the night of the 18th, about half-past ten o'clock, the heavens were illuminated by a brilliant arch, of about ten degrees in breadth, of a deep red or vermillion colour, formed by two streams of light; the one arising in the north-east, passing over Arcturus and Ursa Major; and the other originating in the south-west, leaving Orion to the southward, passing over Aldebaran and Capella, and meeting in the Zenith where the light was very faint. The western limb was the brightest, and at intervals shot forth rays of light approaching to a flame colour. The edges of the main stream were *then* fringed, and had a feathery appearance; the eastern leg of the arch was the first that began to fade, spreading wider, and becoming fainter when that part of the sky was mottled, like that called mackarel sky, but still retaining its red tint; the stars were seen through the Aurora, which had nearly disappeared by eleven o'clock, the moon all the

time shining brightly, and nearly on the meridian, the planet Mars almost touching her south-eastern limb, and Jupiter being but a short distance from her to the westward. The barometer stood at 29·37, the temperature was forty degrees, and a light breeze was blowing from the westward.

March.—Unlike the last month, which was warm for the season, this was the coldest March that has occurred during the last thirteen years,—the maximum never rising so high as temperate, 55° Fah., by four degrees and a half; the minimum was fourteen degrees below the freezing point, and the mean of the month was but little more than three degrees above it. The barometer was generally high, and the mean has been exceeded only four times in the period above referred to. The quantity of rain and melted snow was less than usual for the month. Snow fell on eight different days, viz., the 12th, 20th, 21st, 22nd, 23rd, 25th, 26th, and 27th. That which lay on the ground, and could be measured, was eight inches in depth; and this fell on the 20th, 21st, and 22nd. The wind blew from the northward on eighteen days, and the whole month may be considered as having been dry, bleak, and cold.

April.—The same prevalence of cold was experienced during this, as in last month, and the mean temperature was nearly *three* degrees lower than in any April in the last fourteen years; yet the maximum was five degrees higher than in the same month last year. The barometer was generally steady, the range being small, and the mean but little above that of last year. The quantity of rain and melted snow was much less than that in the corresponding month last year, though more than in the two years preceding 1836. Snow, sleet, and hail fell several times during the month; but the snow never lay upon the ground. An indistinct lunar halo was seen about 9 p.m. on the 14th, and thunder was heard on the 30th about 5 p.m. The commencement of the eclipse on the night of the 21st was not seen advantageously at Wycombe; a thick bank of cloud obscured the horizon, and the moon had risen several degrees before she became visible, and even then she was partly covered by clouds. At the period of the total darkness commencing, large cumuli were formed, and the moon was again hidden until nearly nine o'clock, when the whole disc was seen entirely veiled by the earth's shadow, having a dusky rufous appearance. At nearly half-past nine, the first portion of the moon, cleared from the obscuration, was perceived, when the appearance was extremely beautiful, the brilliancy of the bright limb

of the moon being highly contrasted with that under eclipse. After the eclipse was over, the moon shone with considerable lustre; at least she appeared to do so, from the impression made on the mind by her recent darkness. We had thunder at 5 P.M. on the 25th, and on the 30th A.M. rain; noon cloudy, with high wind and thunder; P.M. fair.

MAY.—Another month of cold and cloudy weather; the mean temperature being lower than any for the same month during the last fourteen years. On three mornings the minimum temperature was observed below the freezing point. The barometer was lower than is usual in the month of May, excepting the year 1835. Hail, rain, and snow fell on the 10th, with thunder at 5 P.M. Hail storm about noon on the 30th. The quantity of rain which fell this month was less than the average, but greater than the amount last year. Distant thunder on the 14th.

JUNE.—The month was warmer than in 1836, although the maximum was not so high as in the last three years, and the minimum was three degrees lower than in June last year. The quantity of rain was less than in any corresponding month since 1826. The barometer was higher than the average of the month, and the mean has been exceeded only twice in the same month, in the last fourteen years; from the 19th to the end of the month was particularly fine, and no rain fell. Thunder, attended with rain, on the 16th at noon; and again at 4 P.M. on the 24th, but without rain.

JULY.—The month was very fine, the quantity of rain being small, little more than one-half of the quantity in July last year, and twenty-one days were without rain. The mean temperature was higher than in the same month last year, but not so high as in the two preceding years. The barometer was lower, as respects the extremes, than in the corresponding month last year; but there was an extraordinary coincidence in the mean and that of last year, the difference being only the ·0029th part of an inch. Thunder was heard on the 18th in the afternoon. The wind was chiefly from the westward, veering from the south-west to the north-west.

AUGUST.—A greater quantity of rain fell during this month than in the same month in the seven preceding years. It has been generally fair in the mornings, and cloudy and overcast in the evenings, or the reverse of this. The mean of the barometer was lower than in the

same months in 1835 and 1836; but the maximum was higher than in any corresponding month in the last four years, and the range of the mercury was but trifling. The maximum and mean temperature was higher than last year, although not so high as in August 1834 and 1835. Thunder at 1 P.M. on the 16th, accompanied with rain, and repeated during the night. Lightning, unaccompanied with thunder, on the 19th. Thunder, rain, and hail on the 26th, from 11 A.M. until noon; a flash of lightning at 11h. 30m. was extremely vivid, and followed by a tremendous clap of thunder; after which the storm abated, and a fair evening ensued.

SEPTEMBER.—The temperature of the month was lower than since September 1833, as respects the mean and maximum, although the minimum in 1834 was half a degree lower. The barometer was higher than in 1835 and in 1836; and only once in the last fourteen years has so little rain fallen in September, viz. in 1832; from the 18th to the end of the month, no rain fell, and the weather was very fine. Thunder at 2 P.M. on the 1st; stormy on the 23rd.

OCTOBER.—The maximum of the barometer was above any one in October, during the journalist's residence at Wycombe (fourteen years), and only twice has the mean been exceeded during that period; the last time was in October 1830, the quantity of rain was small, being much less than the average. From the 5th to the 22nd no rain fell. The mean temperature was below the average, although the maximum was higher than usual; the range was upwards of forty degrees.

The night of the 13th, on which the lunar eclipse occurred, was remarkably clear, and the commencement and progress of the eclipse were seen very favourably; during the total obscuration, the body of the moon was of a dusky red colour, but when she began to emerge from the earth's shadow, and her bright limb was first seen, the appearance was very interesting; the colours of the remaining portion of her disc were from bright orange, to red, purple, and dark blue, but these changed rapidly as the eclipse passed off; the thermometer, during the eclipse, fell from 41°·50, to 35°·25, — or 6°·25! the barometer standing very steadily at 30·38.

NOVEMBER.—The month was colder than any November during the last fourteen years; the barometer was higher than the average of the month, although the maximum has been frequently exceeded; the quantity of rain was more than has fallen in the corresponding

month since 1833. A most brilliant rainbow was seen on the 1st, at a quarter past 3 P.M. The aurora, on the evening of the 12th, was not of long continuance here; at 6 P.M. some red rays shot up from the N.W., and a slight tinge of red was observed in that direction, which at intervals became more brilliant, the moon shining brightly in the N.E.; but clouds soon collected, obscured the moon, and the aurora shortly afterwards disappeared.

DECEMBER.—The mean temperature was above any, in the same month, since 1833; but the maximum was four degrees lower than in December last year. The range of the barometer was small, and the mean above the average of the month, but much lower than in the corresponding months in 1834 and in 1835. Snow fell on the 6th, and about two inches lay upon the ground on the morning of the 7th, but which soon melted. The quantity of rain and melted snow was much more than in the same months of the last three years. On the 18th, 19th, and 20th, it blew hard; and on the 19th, half an inch of rain fell.

RETROSPECT OF THE YEAR 1837, AT CHELTENHAM, GLOUCESTERSHIRE.

JANUARY.—This month presented every diversity of weather,—alternations of a fair, foggy, cloudy, and wet atmosphere prevailed. Few days have passed without rain. The barometer has been very unsteady owing to the frequent changes of the wind; it reached its maximum on the 1st day 30·27 inches, and its minimum on the 23rd 29·05 inches. It is singular that the maximum temperature occurred on the same day as the minimum pressure,—the thermometer on the 23rd, marking 53° Fahrenheit. The minimum temperature took place on the same day the maximum pressure occurred, viz., on the 1st, the thermometer being at 25° Fahrenheit.

The following table shews the maximum, minimum, and mean of the thermometer, in the month of January, for different years:—

JANUARY.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1822	51°5	27°5	39°5	1832	49°5	31°5	40°2
1825	54·5	31·0	42·75	1833	48·5	27·0	36·65
1826	46·5	18·5	33·75	1834	57·5	35·0	47·15
1827	52·5	16·0	34·25	1835	55·0	20·0	35·24
1828	56·5	27·0	42·45	1836	50·0	23·5	38·86
1829	52·0	17·0	34·0	1837	53·0	25·0	37·52
1830	42·5	10·0	32·15	1838	47·0	12·0	30·25
1831	50·0	25·0	36·47				

Prevailing Winds in January, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	3½	3	6½	3½	4	3½	2	5

FEBRUARY.—This month has been cold, with alternations of gloomy and fair weather: few days without rain. The wind was generally from the south-east and south-west, and the barometric pressure greater than in the last month. Snow fell on the 24th and 26th, and dense fogs on the mornings of the 15th and 27th. Maximum pressure on the 4th 30·10 inches; temperature on the 16th 54°·5. Minimum pressure on the 11th 28·82 inches; temperature on the 25th 28°·0.

THERMOMETER IN FEBRUARY FOR DIFFERENT YEARS.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1822	52°5	30°0	41°25	1832	55°0	28°5	39°9
1825	51·0	28.0	39·75	1833	54·5	30·0	43·69
1826	55·0	33·5	45·14	1834	52·5	32·0	43·17
1827	52·5	18·5	33·17	1835	52·5	29·0	42·37
1828	57·5	27·5	42·09	1836	52·0	26·0	38·49
1829	54·0	27·0	41·26	1837	54·5	28·0	41·87
1830	58·0	17·0	36·85	1838	47·5	23·0	33·4
1831	61·0	29·0	42·7				

Prevailing Winds in February, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	..	2	..	5	..½	4½	7½	8½

MARCH.—This month has been generally cloudy in the mornings, with fair and clear evenings. Snow fell on five days, and sleet on the morning of the 28th. The winds have been chiefly from the north-east and south-west, and the barometer constantly changing its position. The temperature has been more uniform than the pressure, although the thermometer has been lower than in the five preceding years, excepting the year 1835, when it stood nearly two degrees lower. Maximum pressure on the 1st, 30·15 inches; temperature on the 10th, 47°. Minimum pressure on the 11th, 29·02 inches; temperature on the 24th, 20°.

THERMOMETER IN MARCH FOR DIFFERENT YEARS.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	57°0	26°5	41°75	1831	60°5	32°5	46°52
1822	62·5	30·5	46·5	1832	56·0	31·0	44·6
1825	59·0	30·0	44·5	1833	54·5	29·0	39·88
1826	66·0	28·0	44·17	1834	56·0	30·0	45·4
1827	57·0	28·5	43·84	1835	59·5	30·5	42·28
1828	59·5	27·0	45·0	1836	61·0	29·5	43·08
1829	58·0	28·5	41·73	1837	47·0	20·0	36·5
1830	69·0	36·5	48·4	1838	59·5	30·0	42·46

Prevailing Winds in March, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	5	..½	4½	..	8½	3	2½	7

April.—This month has partaken of its usual character for "clouds and rain," with but few alternations of sunshine. The range of temperature has been greater than in the corresponding month of the six preceding years, excepting 1835, when the range was eight degrees more. There has been a less quantity of rain this month than in the same month of the three past years, and only one-third of the amount which fell in April, 1833. The winds have been chiefly from the north-east, north-west, and south-west points. Maximum pressure on the 8th, 30·15 inches; temperature on the 26th, 58°·0. Minimum pressure on the 30th, 29·12 inches; temperature on the 9th, 26°·0.

THERMOMETER IN APRIL FOR DIFFERENT YEARS.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	74°0	31°5	52°5	1831	62°5	34°5	49°63
1822	72·0	32·5	42·25	1832	69·5	38·5	49·77
1825	63·5	35·0	49·25	1833	64·0	35·0	48·37
1826	65·0	31·0	49·66	1834	61·0	33·0	46·63
1827	74·0	32·0	49·03	1835	69·0	29·0	48·32
1828	71 5	32·0	49·81	1836	60·0	31.5	45·32
1829	59·5	32·5	46·9	1837	58·0	26·0	41·12
1830	74·5	26·0	50·39	1838	63·0	28·5	44·69

Prevailing winds in April, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	1½	1	4	2	6	5½	..½	9½

May.—A low barometer, a south-west wind, and showery weather ushered in this month; the barometer continuing to fall from the 5th until the 10th, when the wind became more northerly, and we had a little fair weather: this however did not continue long, but from the 11th till the 21st we had clear and fair weather, with a northerly wind; it continued fair until the end of the month. The mean temperature was lower than in the corresponding month of fourteen preceding years; the range also was less than in the last year, but greater than in 1834 and 1835. The quantity of rain was more than in May last year, but considerably less than in 1834 and 1835. Maximum pressure on the 16th, 30·14 inches; temperature on the 17th 69°·0. Minimum pressure on the 1st, 29·35 inches; temperature on the 9th, 35°·5.

THERMOMETER IN MAY FOR DIFFERENT YEARS.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	68°0	34°0	51°0	1832	70°0	38°5	54°25
1825	72.5	41·0	56·75	1833	79·0	41·0	59·26
1826	74·5	35·0	52·35	1834	69·0	43·5	56·2
1827	73·5	40·5	53·15	1835	67.5	41·0	52·5
1828	72·5	41·0	57·05	1836	73·0	37·0	52·34
1829	73.5	41·0	56·38	1837	69.0	35·5	51·07
1830	75.0	40·0	55·45	1838	72·0	36·5	51·97
1831	69.5	33.0	54·15				

Prevailing Winds in May, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . . .	..½	..½	9	2	4	2½	2	10½

JUNE.—The month was introduced by cloudy and unsettled weather, with a north-west wind and a rising barometer. On the evening of the 3rd the wind veered to the south-west, and continued in this quarter until the 23rd, occasioning a low barometer, and inducing cloudy and unfavourable weather, with several rainy days. The mean temperature has been higher than in the last four years, and less than in 1831 and 1832; the range has been 6° less than in 1835, and with this exception greater than in the same month of the six preceding years. The amount of rain has been much less than in the last four years, and the prevalence of south-westerly winds has been the same as in 1830, less than in June 1834 and 1836, but more than in 1825–6–7–8–9–1830–1–2–3–5. There has been less of westerly winds than in the twelve preceding years. Maximum of pressure on the 23rd, 30·06 inches; temperature on the 16th, 76°. Minimum pressure on the 9th, 29·744 inches; temperature on the 7th, 42°.

THERMOMETER IN JUNE FOR DIFFERENT YEARS.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	74°5	43°0	58°75	1832	73°5	48°5	60°3
1825	78·5	40·0	59·25	1833	76·0	46·0	58·08
1826	86.0	47·0	50·97	1834	77·0	45·0	59·13
1827	77·5	44·5	58·66	1835	81·5	41·0	59·81
1828	77·0	43·0	59·98	1836	77·0	46·5	58·74
1829	76·0	42·5	54·8	1837	76·0	42·0	59·99
1830	70·0	43·0	58·8	1838	73·0	45·0	58·0
1831	72·5	48·0	61·3				

Prevailing winds in June, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	5	1	½	3½	2½	2	3½	12

JULY. — The month commenced with fine summer weather, an easterly wind and a high barometer; the weather continued fair until the 13th, when we had clouds and showers for two days, and, with slight intermission, it was fine through the month. The wind has been generally from the west and south-west. The mean temperature has been higher than in the five preceding years, but nine degrees lower than in 1825. The range, however, was 10°5 less than last year, but 7° higher than in 1834. The amount of rain was less than in the corresponding month of 1836, and more than in 1835. Maximum pressure on the 1st, 30·08 inches; temperature on the 26th, 77°. Minimum pressure on the 29th, 28·87 inches; temperature on the 1st, 48°.

THERMOMETER IN JULY FOR DIFFERENT YEARS.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	79°5	42°5	61°0	1831	77°5	50°0	63°36
1824	73·5	51·5	62·3	1832	76·5	49·0	62·5
1825	93·5	51·5	72·5	1833	74·0	46·0	60·07
1826	83·0	48·0	66·37	1834	78·0	51·0	61·76
1827	80·5	52·5	64·1	1835	81·0	50·0	62·74
1828	78·5	46·0	61·91	1836	85·0	45·5	60·24
1829	79·5	49·0	63·55	1837	77·0	48·0	63·2
1830	81·5	49·0	63·06	1838	73·0	46·0	57·42

Prevailing Winds in July, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	6	8	2½	2	2½	2½	..	7½

AUGUST.—Clouds and rain ushered in the harvest month, and a violent storm occurred on the 4th day, when above one inch of rain fell before noon. This was succeeded by six clear days, after which time clouds and alternations of sunshine characterised the month. South and south-westerly winds prevailed. The wind was much unsettled, and the barometer, consequently, changing its position. The mean temperature was two degrees higher than it was last year, but the range was precisely the same as in the corresponding month of the preceding year. The amount of rain was three and a half inches greater than in August last year, and four inches more than in 1833-4 and 1835. Maximum pressure on the 7th, 30·12 inches; temperature on the 17th, 75°. Minimum pressure on the 29th, 29·21 inches; temperature on the 26th, 45°.

THERMOMETER IN AUGUST FOR DIFFERENT YEARS.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	82°0	46°5	64°25	1831	77°5	52°5	64°47
1824	74·5	45·0	60·98	1832	76·0	49·0	61·11
1825	85·0	52·5	68·75	1833	69·5	45·5	57·64
1826	84·0	51·5	65·0	1834	77·5	44·0	59·98
1827	74·0	46·5	60·37	1835	80·5	48·0	62·64
1828	74·0	46·5	60·07	1836	74·5	44·5	58·4
1829	72·5	46·0	59·0	1837	75·0	45·0	60·6
1830	74·0	43·5	58·24				

Prevailing Winds in August, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	3½	1½	..	6½	4½	3	3½	8½

SEPTEMBER.—Wet and cloudy weather still predominating, introduced the eighth month with unfavourable aspects, but towards the middle of the month it became fair, and continued so to the end. Wind, chiefly from south-east and south-west, accompanied with a low barometer and frequent showers;—although less rain fell this month than in the four preceding years. The mean temperature was higher than in 1836, but the range was one and a half degree less. Maximum pressure on the 25th, 30·05 inches; temperature on the 20th, 69°·0. Minimum pressure on the 13th, 28·86 inches; temperature on the 27th, 43°5.

THERMOMETER IN SEPTEMBER FOR DIFFERENT YEARS.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	72°5	44°5	58°5	1831	68°0	46°0	58°08
1824	81·0	38·0	59·5	1832	72·0	45·0	58·51
1825	74·0	49·0	61·5	1833	63·0	40·5	54·3
1826	70·5	43·0	58·1	1834	72·5	46·0	58·39
1827	68·5	48·5	57·76	1835	71·5	42·0	56·21
1828	75·0	42·5	59·15	1836	67·0	40·0	53·2
1829	64·0	41·5	53·76	1837	69·0	43·5	55·43
1830	67·0	43·5	55·09				

Prevailing Winds in September, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	3½	2	1½	4	5½	1	5	7½

OCTOBER.—The prevalence of south-east and south-westerly winds, with a falling barometer and cloudy and wet weather, with slight

intermissions of sunshine, introduced "the little summer." On the 10th, however, it became clear, and fair weather ensued, which continued without rain, except on the 14th, until the 23d; the remainder of the month was showery. Although south-westerly winds prevailed, the amount of rain was considerably less than in October last year, but nearly one inch and a half more than in 1834. The temperature was higher than in the three preceding years, but lower than in the same month of the years 1830-1-2-3, and the range was three and a half degrees less than in 1836. Snow fell on the 25th. Maximum pressure on the 14th, 30·38 inches; temperature on the 3d, 68°5. Minimum pressure on the 30th, 28·96 inches; temperature on the 24th, 36°5.

THERMOMETER IN OCTOBER FOR DIFFERENT YEARS.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	60°0	36°5	52°25	1831	68°0	43°0	57°33
1824	64·0	32·0	48·0	1832	65·0	40·0	53·33
1825	64·5	35·5	50·0	1833	62·5	39·5	51·5
1826	65·0	37·0	54·26	1834	69·0	33·5	50·75
1827	61·5	38·0	52·43	1835	61·0	35·5	48·73
1828	63·0	37·5	51·04	1836	61·5	26·0	48·2
1829	62·0	32·5	48·09	1837	68·5	36·5	51·3
1830	71·0	38·5	52·36				

Prevailing Winds in October, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	..	5	2	1	3	1½	1½	17

NOVEMBER.—The month entered with a low barometer and south-westerly winds, accompanied with rain and a variable temperature. From the 6th to the 10th, fair weather predominated, which gave way to showery and unpleasant weather, and continued so until the end of the month. The barometer was below 30 inches, excepting on the 6th and 7th. In comparing the mean temperature of this month with the corresponding month in 1835 and 1836, there is an increase of one degree more than in the latter year, and four degrees more than in the former year; the range, on the contrary, has considerably diminished, being ten degrees and fourteen degrees less than in the before-mentioned years. The amount of rain has also been less than in the four preceding years. Maximum pressure on the 7th, 30·12 inches; temperature on the 1st, 54°5. Minimum pressure on the 1st, 28·63 inches; temperature on the 17th, 29°.

NOVEMBER.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	61°0	30°5	45°75	1831	58°0	32°0	46°08
1824	57·0	32·0	44·5	1832	59·0	29·5	44·27
1825	56·5	29·5	38·5	1833	60·5	33·5	46·94
1826	54·0	27·5	43·65	1834	60·5	31·0	41·69
1827	60·0	25·0	45·42	1835	55·5	31·5	36·92
1828	57·0	28·0	47·28	1836	57·0	26·5	40·02
1829	56·0	34·5	35·11	1837	54·5	29·0	41·99
1830	61·0	33·0	36·76				

Prevailing Winds in November, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	..	3½	2	3	..	4½	4½	12½

DECEMBER. — The last month was ushered by fair and frosty weather, and, excepting in the middle of the month, there were few rainy days. Toward the end of the month the weather became mild; the mean temperature was nearly the same as last year, but lower than in five years preceding; the range was seven degrees less than in 1836, and 13°5 less than in 1830. The amount of rain was a little less than in December last year. Maximum pressure on the 4th, 30·25 inches; temperature on the 21st, 55°0. Minimum pressure on the 18th, 29 inches; temperature on the 5th, 31°5.

DECEMBER.

	Max.	Min.	Mean.		Max.	Min.	Mean.
1821	59°0	30°5	44°75	1831	58°5	35°0	23°5
1824	53·0	28·0	25·0	1832	56·5	34·0	22·5
1825	53·0	24·0	29·0	1833	57·5	33·0	24·0
1826	55·5	31·5	23·5	1834	55·5	31·0	24·0
1827	55·5	27·0	28·5	1835	53·0	16·0	37·0
1828	56·0	31·0	25·0	1836	54·5	21·0	33·5
1829	49·5	22·0	27·5	1837	55·0	20·0	23·5
1830	52·0	15·0	37·0				

Prevailing Winds in December, 1837.

Direction .	E	W	N	S	NE	NW	SE	SW
Days . .	4	..½	1	4	4½	..½	8½	8

RETROSPECT FOR 1837, AT GOSPORT, HAMPSHIRE.

JANUARY.—This month has been generally humid and wet, and rather mild for the season, excepting the first three or four days while the snow continued on the ground; it has also been unusually dark and dreary, in consequence of the superabundance of low clouds and haziness of the air. By means of the cloudy and overcast state of the sky, and the inosculation of dry and damp airs from different quarters, there was but little tendency to, and scarcely any vent for evaporation from the surface of the earth: hence we may, in some measure, judge of the impurity of the lower medium of the atmosphere to a great extent in north latitude, and its effects have been severely felt the last fortnight in the prevalence of the most fatal epidemic, the influenza, &c., that has occurred in Europe for many years past; nor has it affected persons of all ages only, but attacked a great many herbaceous and other animals.

The maximum temperature of the external air occurred in the nights of the 5th, 12th, 20th, and 29th. There was a little snow, with some sleet, on the 12th, 16th, and 29th.

During the period there were four gales of wind, namely, one from NE., one from E., and two from SW.

SUMMARY OF THE WEATHER.

A clear sky, $2\frac{1}{2}$; fine, with various modifications of clouds, 5; an overcast sky without rain, 15; foggy, $\frac{1}{2}$; rain, 8.—Total, 31 days.

CLOUDS.

Cirrus 6, Cirrocumulus 4, Cirrostratus 30, Stratus 1, Cumulus 2, Cumulostratus 2, Nimbus 20.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	NW	Days
5	5	2	$1\frac{1}{2}$	3	4	6	$4\frac{1}{2}$	31

FEBRUARY.—This month, to the 7th inclusive, was fine and dry, but the latter part was very wet and mild, excepting two or three days, with occasional strong gales of wind. The quantity of rain the last three weeks overflowed many of the low lands in this county; but a

wet February is not unseasonable, if it be followed by dry March winds. The mean temperature of the external air this period, 42°9 degrees, is nearly a degree higher than the mean of February for a long series of years.

In the nights of the 13th and 17th there were large halos and small rings of colours round the moon: rings of bright colours, burrs, and coronæ also surrounded the moon in the evenings of the 15th and 20th, and were soon followed by rain.

A few minutes before 10 P.M. on the 18th, as soon as the clouds had dispersed (for the evening was wet and windy), a *red arch* of fluid matter appeared across the firmament, but which was not diminished in colours by the strong unobstructed lunar light, except a small part when near the moon. The bearings of the arch were ENE. and WSW. nearly; and its astronomical position with regard to the constellations was over the body of Bootes, Berenice's Hair, the breast of the Lion, the body of the Crab, the feet of the Twins, the shoulders of Orion, and through the River Eridanus. This position, however, was not immutable, for the arch moved slowly (nearly a degree per minute) northward, and its vortex coincided with the zenith at forty minutes past ten; but its bearings were then very little altered. During this interval its width increased from three to six degrees; and at eleven it was at least ten degrees wide near the eastern horizon, and nearly the same width towards the west. So much of the fluid had collected together at the centre of the arch while advancing to the zenith, that it spontaneously separated on each side, and moved both southward and northward in detached irregularly shaped clouds, some of which in their descent were like inverted cones, and of a yellow colour, similar to that of the luminous columns of an aurora borealis: in fact, luminous streams were frequently seen rising on the northern side of the arch, but they soon changed to red, perhaps from the humid state of the atmosphere immediately after the rain. Between ten and eleven, it being Saturday night, hundreds of spectators were assembled in the streets and outside the town viewing the awfully grand phenomenon, some of them with gratification, the superstitious with terror, and others calmly discussing its cause, the quality of the arch, and the probable effect it would have on the atmosphere. Soon after eleven the arch began to break in the zenith and near the western horizon, and dispersed in numerous masses of cloud, many in the southern, but the greater part in the northern hemisphere, to within 18 or 20 degrees of the horizon, still retaining their red tint. The western end of the arch had now moved two or three degrees to the north of west, but the eastern end kept its position within half a

point till midnight; nor was its motion affected by the wind next to the earth, as it blew fresh from due west. Through the dense red masses the principal fixed stars shone with their usual brilliancy. The reflection of the crimson colour from the eastern end of the arch upon the water in Portsmouth Harbour, gave it the appearance of a sea of blood.

Although there was no visible aurora in, nor any rising columns of light from the northern horizon, I have, from long practice in observing, many good reasons for referring this splendid arch to the finest specimen of the aurora borealis; and it is probable, if it had not been a rainy evening, that the arch would have been luminous, or of a light yellow colour.

In eight hours after the disappearance of the arch, a hard gale of wind came on from the SW. with continual rain through the day and night, amounting to four-fifths of an inch in depth, the usual effects of such a phenomenon on the atmosphere here. From the various deviating descriptions of the phenomenon in different newspapers, it is desirable to be informed, whether, in reality, the arch was generated by a substance in the heavens like a cloud diverging to the eastern and western horizon, or whether it rose from beneath the horizon. This would lead to a more certain determination of its cause.

I first saw it nearly a complete arch at the time above mentioned. During the appearance of the arch there was an occultation of Mars behind the moon. The immersion of the planet was in the dark part of her lower limb about 46 minutes past ten o'clock, and his emersion at her western limb at 55 minutes past eleven mean time nearly. Mars being nearly opposite to the sun, and, in consequence, having a large round disc, was prettily cut by the moon's circular limbs at the times of his immersion and emersion.

There are now two parallel rows of about thirty small and large black spots across the central part of the sun's disc, some of which will disappear in a few days.

Early in the morning of the 26th there was ice one-eighth of an inch thick on the ground, the first that appeared during the month, and the minimum temperature for the period occurred the preceding night. The 26th being a cold day, with a due north wind, small flakes of snow fell for two or three hours in the evening, and also in the night of the 28th. This inversion of a progressive rise of temperature often occurs at the time of the near approach of the Georgian to the sun, which was the case nearly on this occasion. The maximum temperature of the external air occurred in the nights of the 8th, 12th, and 19th. The atmospheric and meteoric phenomena that have come within our observation this month, are one paraselene, one solar and

two lunar halos, one bright meteor, one rainbow; and seven gales of wind, namely, five from SW. and two from NW.

SUMMARY OF THE WEATHER.

A clear sky, $3\frac{1}{2}$; fine, with various modifications of clouds, 10; an overcast sky without rain, 7; foggy, $\frac{1}{2}$; rain, 7.—Total, 28 days.

CLOUDS.

Cirrus 12, Cirrocumulus 8, Cirrostratus 26, Stratus 0, Cumulus 12, Cumulostratus 2, Nimbus 19.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	NW	Days.
2	1	$1\frac{1}{2}$	4	$3\frac{1}{2}$	8	5	3	28

MARCH.—This month has been very cold for the season, and rather dry; but light showers of rain and snow have often occurred, and kept the lands sufficiently moist for ploughing and sowing.

As a proof of the unprecedented inclemency of the weather, it is only necessary to observe that snow, more or less, fell here on the 1st, 12th, 13th, 20th, 21st, 22nd, 23rd, and 26th; but a stronger proof may be adduced in the mean temperature of the external air for the month, being 5°8 degrees lower than the mean of March for the last 21 years, and $1\frac{1}{2}$ degree colder than the coldest March in that period: moreover, the mean temperature of the air this month is not only four degrees colder than that of the preceding, but actually *half a degree colder* than the mean of last January. These circumstances have not, we believe, a parallel in any meteorological journal kept in this country for the last age. The March of 1807, and of 1833, were certainly very cold and dry periods, but not so low in their mean temperature as that of this month. In the midland and northern counties, upon elevated tracks of land, where the snow lay two or three feet deep without drift, and a week on the ground, the thermometer must have receded 14 or 15 degrees below the freezing point: hence we cannot be surprised at hundreds of sheep and some cattle having perished by the severity of the frost, after enjoying a comparatively mild January and February. The inclemency of the weather has not been confined to the parallels of latitude above 50 degrees north, for it is said to have snowed in Rome on the 20th, which was considered there to have been a very rare phenomenon at the vernal equinox; and nearly the same sort of weather was experienced in Spain, Italy, France, Germany, &c.

The influence that the north-east wind had on the temperature of the atmosphere from the 13th to the 20th, was the means of bringing down the thermometer in the night of the 20th to 24 degrees; it also receded to the same degree in the night of the 24th, and to 28 degrees in the night of the 26th.

In the morning of the 21st and 25th the pumps and ponds, and the moat round the fortification of the town were firmly frozen, when the ice was an inch and a quarter thick. The snow on the ground on the 21st, 22nd, and 23rd, was upwards of three inches deep upon a plain surface, and it did not entirely dissolve till the morning of the 27th.

It is remarkable, too, that Good Friday, the 24th, should have been the coldest day and night this year, excepting the 1st of January.

During the time of the greatest cold, that is, from the 20th to the 27th, there was a sesqui-square, or an aspect of 135 degrees of the planet Saturn with the sun, aided by an opposition of the moon, which (as well as that of her conjunction) almost invariably induces humidity, and a condensing state of the atmosphere—hence the frost and snow.

A close trine aspect of the same planet with the sun occurred on the 7th, which, by comparative thermometrical observations, lessened the minimum temperature 7°, and the mean temperature 4°.

There was also a semi-sextile aspect of the Georgian planet with the sun on the 30th, when the mean temperature for the twenty-four hours was reduced $6\frac{1}{2}$°, notwithstanding it was influenced by the least of all the aspects.

I mention the practical results of the aspects of these two distant planets in connexion with the remarkable vicissitudes of the weather this month; yet it may be shewn, in numerous instances, by those who keep registers of the weather, that a great diminution of temperature takes place at or near the time these planets are aspected with the sun: and on the contrary, that a considerable increase of temperature occurs when the planets Jupiter and Mars, particularly the former, have aspects with the sun.*

A cold March always superinduces a backward spring like the present; but a late spring generally brings forth a fruitful summer: how admirable, then, and beneficial too, are the designs of an overruling Providence in the various operations of nature!

The atmospheric and meteoric phenomena that have come within our observation this period, are two solar halos, snow on several days, and five gales of wind, namely, one from the N. and four from NE.

* But query, Ed.

SUMMARY OF THE WEATHER.

A clear sky, 4; fine, with various modifications of clouds, 10; an overcast sky, without rain, 13; foggy, $\frac{1}{2}$; rain and snow, $3\frac{1}{2}$.—Total, 31 days.

CLOUDS.

Cirrus 13, Cirrocumulus 4, Cirrostratus 29, Stratus 0, Cumulus 20, Cumulostratus 14, Nimbus 15.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	NW	Days.
6	11	2	$\frac{1}{2}$	1	$3\frac{1}{2}$	5	2	31

April.—The first and last weeks of this month were wet, with a low temperature; the other part was dry, but exceedingly cold for the season, with a boisterous north-east wind. Here we had snow, more or less, on the 5th, 7th, 8th, 10th, 11th, 12th, and 16th. This wintry state of the atmosphere caused the temperature on and near the earth to be very low till the 18th, insomuch that the mean for this month is six and a half degrees lower than the mean of April for a long series of years; and it is also one-seventh of a degree below the mean of last February.

On the 5th it snowed here from 3 till 10 A.M., and the depth upon a plane surface was one inch and a half, accompanied with a heavy gale from NE., but it dissolved in the course of the day.

After a sharp frost and much ice in the morning of the 10th, it snowed several times in the day, and covered the surrounding hills, upon which it remained all the night. In the afternoon of the 11th, both granular and very large flakes of snow fell for several hours from passing Nimbi, to the depth of half an inch on the ground. The lowest diurnal maximum temperature for the month was 40° on the 13th, which, if not directly influenced, was accompanied by a semi-square aspect of the Georgian planet with the sun.

On the 16th, at 6 P.M., there were two parhelia near the western horizon, one on each side of the sun, without any trace of a solar halo; but a large lunar halo soon after made its appearance. Three paraselenæ were observed here in the night of the 20th, and were followed by steady rain. In the morning of the 25th some swallows appeared for the first time this spring. At 10 A.M. on the 26th, two parhelia appeared with white trains about 8° long, but there was no trace of a solar halo. In the evening of the 27th, at half-past 9 o'clock, an aurora borealis presented itself. The first wide column of

light rose from it at a quarter before ten to an altitude of 33°, and two meteors appeared soon after. Both Cirrus and Cirrostratus clouds were too much in the way for observations, and the former, in the NW. quarter, was of a light red colour.

Spring-water did not come to its minimum temperature for the year till about the 23rd instant, which was nearly a month later than its usual time.

Another proof of the extreme backwardness of the spring may have been seen in the slow and late budding of the fruit-trees; nor have the blossoms in the most favourable situations scarcely began to develope themselves; besides, it was generally remarked in the middle of the month, that the exterior parts of the buds were quite brown, and some black from the nipping frosts. Vegetation, too, made no perceptible growth for the first three weeks, and much that was promising perished by means of the night frosts: however, the increased temperature of the external air, and the mild steady rains the last week have done wonders for these things, as well as the pastures and young wheat. Not only have sheep and cattle suffered materially from the inversion of the season, but human constitutions also, by universal colds, coughs, &c., during the last four months.

The atmospheric and meteoric phenomena that have come within our observation this month, are four parhelia, three paraselenæ, one solar and three lunar halos, three meteors, one aurora borealis; and nine gales of wind, namely, five from NE., one from E., one from SW., one from W., and one from NW.

SUMMARY OF THE WEATHER.

A clear sky, 3; fine, with various modifications of clouds, $10\frac{1}{2}$; an overcast sky without rain, 11; foggy, $\frac{1}{2}$; rain, 5.—Total, 30 days.

CLOUDS.

Cirrus 14, Cirrocumulus 3, Cirrostratus 28, Stratus 0, Cumulus 21, Cumulostratus 14, Nimbus 19.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	NW	Days.
$2\frac{1}{2}$	7	1	$3\frac{1}{2}$	$1\frac{1}{2}$	$6\frac{1}{2}$	3	5	30

MAY.—This month, generally speaking, has been fine, but changeable, with frequent refreshing showers, till the 21st; and afterwards it was dry, with an increased temperature.

In the evening of the 6th an aurora borealis appeared from half-

past 10 P.M. till after 1 A.M. Soon after eleven o'clock several columns of light rose from the aurora, between NNW. and NW. by W., to an altitude of 37°, and changed to light red; but the clouds too much interposed to enable me to ascertain the extent and altitude of the auroral arch. In the night of the 9th we had a frost and a little ice on the ground: there was also hoar frost early in the mornings of the 10th, 22nd, and 23rd. On the 14th, at 6 P.M., a thunder-storm passed by to the eastward, with lightning and thunder; and between three and four the same afternoon, there was a heavy thunder-storm in London. Two currents of air observed here at the time crossed at right angles and generated the storm, which was seen at a great distance, in a northerly direction, as early as five o'clock.

On the 17th the maximum temperature of the external air in the shade was 72°, with a close conjunction of Venus with the sun, but on the 20th it rose only to 52°, a difference of 20° in three days, which was very sensibly felt. The square aspect of the planet Mars with the sun on the 20th had no effect on the temperature of the atmosphere, in consequence of the humidity of the air, which we imagine was occasioned by the opposition of the moon, the near opposition of Saturn, and the close conjunction of Venus with the sun: yet these preventives to heat are scarcely sufficient to account for so great a diminution of temperature on the 20th. In the evening of the 17th there were passing beds of Cirrostratus, in which a large lunar halo was formed, and two paraselenæ, from ten till twenty minutes to eleven o'clock: these mock moons were respectively distant from the moon's centre 23° 15′, and well-formed at intervals; they were circular, a little larger than the moon, tinged with light red, and shewed conical trains a few degrees long. The halo disappeared before them, and that on the western side of the moon wore off before the other. In the evening of the 18th a parhelion appeared on the northern side of the sun, at 6 P.M., and from nine till ten in the evening there were three faint paraselenæ, and a large lunar halo for several hours in the night.

The mean temperature of this month is 5° lower than the mean of May for a long series of years, and only corresponds to that of April. The evaporation, too, is smaller in quantity than in any May since 1816, which, of course, is owing to the great reduction of temperature.

We have not observed more profuse and beautiful blossoms on the fruit-trees generally for many years past, and the young fruit seems to be firmly setting. Notwithstanding the extreme backwardness of

the spring, and the uncommon vicissitudes of the weather up to the 21st, we may truly affirm that in natural appearances,

> May is the fairest month in all the year,
> When *Nature* smiles on fields, parterres, and bowers,

and when she displays her richest attire,

> Zephyrs waft fragrance from her lovely flowers.

The atmospheric and meteoric phenomena that have come within our observation this month, are two parhelia, five paraselenæ, one solar and two lunar halos, seven meteors, one aurora borealis, lightning and thunder once, and one gale of wind from SW.

SUMMARY OF THE WEATHER.

A clear sky, 5; fine, with various modifications of clouds, $15\frac{1}{2}$; an overcast sky without rain, 6; rain, $4\frac{1}{2}$.—Total, 31 days.

CLOUDS.

Cirrus 19, Cirrocumulus 8, Cirrostratus 28, Stratus 0, Cumulus 26, Cumulostratus 15, Nimbus 14.

A Scale of the prevailing Wind.

N	NE	E	SE	S	SW	W	NW	Days.
6	5	1	4	2	5	6	2	31

JUNE.—This month, to the 9th, was fine and dry, but seasonable and refreshing showers followed almost daily, to the 21st inclusive; then another dry period, which was favourable for haymaking, followed to the end of the month.

The first meteorological object for consideration this month, is the real state of the temperature of the atmosphere, and in comparing it with the mean of June for a long series of years, it appears to be only $1\frac{1}{2}^{\circ}$ below it; whereas, last month, (May,) it was 5° short of the mean: therefore it has progressively increased, which increase, with the nutrition of the late warm rains, has given a promising appearance to the growing corn, and brought forward vegetation in a surprising manner.

The wheat in this neighbourhood not having generally come into ear till the 21st, (nearly three weeks later than the usual time,) the corn-harvest will be rather late.

The wheats now, (June 30th,) display a fine rich bloom, and the barley is bursting into long and healthy ears; but they require soaking showers, in order to lengthen their stems. The doubt, as to the

success of the corn harvest, in the south of England, is negatived, by means of the late propitious growing weather.

The hay was got in and ricked here in good condition by the close of the month; and the farmers being satisfied with their crops is the best proof that they are, at least, good average ones, about one-eighth more than that of last year.

After a profuse show of blossoms, the apples in this neighbourhood are abundant: pears, plums, and wall-fruit generally, have not set so well, and in many places there will be but a small quantity, having been much blighted by the cold nocturnal easterly wind the first week in the month.

In the afternoon of the 7th three parhelia appeared from half-past five till half-past six o'clock; those in a horizontal line with the sun were 23° 6′ distant from his centre, with short white trains—the other, at the vertex of the solar halo, was faint, circular, and colourless, and they were soon followed by frequent showers of rain.

In the afternoon of the 17th there was a solar halo and two parhelia, followed by rain in the night.

At half-past five P.M. on the 22nd, a parhelion was observed in an attenuated cirrostratus cloud, on the northern side of the sun; it was a perfect image of that body, circular and colourless, and it appeared and disappeared several times in the course of twenty minutes. On the 24th and 25th the air was hot and hazy at times, and yellow sunshine protruded through lofty cirrostrative vapour. Many planetary aspects about this time, with a semi-square aspect of Jupiter and the sun, induced an additional heat of 10° in the maximum temperature of each day; and the compound clouds shewed at intervals an electrical quality, but neither a thunder-storm nor lightning followed. After the 25th the temperature decreased, as the trine aspect of the Georgian planet approached at the close of the month, making a difference of 15° in the maximum temperature of the 24th and July 1st. This difference indicates the influence the large body of Jupiter has in accumulating caloric, or in raising the temperature of the lower medium of the atmosphere when aspected with the sun; and, we may add, that the aspects of the Georgian planet, a comparatively small body at the bounds of the solar system, and now on the left knee of Aquarius, have generally the effect of lessening the temperature of the atmosphere nearly half the quantity that Jupiter in aspect has in raising it.

The atmospheric and meteoric phenomena that have come within our observation this month, are six parhelia, three solar halos, three

meteors, two rainbows, lightning once; and four gales of wind, namely, one from NE., one from the E., and two from the SW.

SUMMARY OF THE WEATHER.

A clear sky, 6; fine, with various modifications of cloud, 15½; an overcast sky without rain, 6; rain, 2½.—Total, 30 days.

CLOUDS.

Cirrus 21, Cirrocumulus 12, Cirrostratus 29, Stratus 1, Cumulus 23, Cumulostratus 12, Nimbus 12.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	NW	Days.
1	3½	3	8	2	7½	2½	2½	30

JULY.—It is pleasing to me to be enabled to give a short but satisfactory report of the improved state of the weather this month, and its beneficial effects on the growing corn, vegetation, and fruits for the last fortnight.

The first part of the month to the 13th was dry and fine, with hot sunshine on two or three days; but the lower atmosphere was not arid, nor the temperature in the shade above summer heat: the latter part was alternately showery and fine, with nearly a uniform temperature.

The wheat began to assume a yellow hue on the 12th, and a visible improvement appeared in it in a few days after the genial and much-wished-for showers of rain, which swelled out the grains, and gave a sudden spring to the then exceedingly short-stemmed barley. It is true that both vegetation and fruits have been stunted and otherwise injured by means of the droughts, but now they have a more favourable appearance.

Much wheat in and about our immediate neighbourhood will be fit for the sickle before the middle of August, and the operations of the harvest will be pretty general in the third and last week, which, considering the very backward spring, could not have been anticipated by the most experienced practical farmer. Nature, after an alarming sluggishness, has seized time by the forelock, and in this instance has made an astonishing effort to keep pace with the season, for which every one interested in the public welfare will feel doubly thankful. Is she then not worth contemplating in every possible way as regards our moral benefit? and especially at a time when men's hearts fail at her singular deviation from a regular course. We ought to state that,

as the changes of the weather are likely to be frequent in August, it will require every precaution and vigilance of the agriculturists, in order to get in the corn harvest satisfactorily.

As the sextile aspect of the planet Mars with the sun approached from the 15th to the 19th, many thunder showers passed over, with frequent thunder in the day-time.

A very strong gale prevailed here from the 28th to the 30th, with heavy rain, lightning, and thunder at intervals: it was the means of dislodging much unripe fruit from the trees. A little before the cessation of the gale in the afternoon of the latter day, a singular appearance of coloured parhelia and parts of solar halos was observed here, from a quarter past five till after six o'clock. First the greater part of a halo, whose semi-diameter was 22° 40′, appeared round the sun, accompanied with one perpendicular and two horizontal parhelia at the exterior edge of the halo. Through the upper parhelion an inverted arc of another halo, about twenty-three degrees of curvature, was formed with vivid red and yellow colours, which arc did not finally disappear till the sun had descended to the horizon. Above or northward of these was a large semi-halo of faint red and yellow, which had the sun for its centre, as at all parts of its circumference it was between 45° and 46° distant from him, and it continued in sight till six o'clock, when the passing clouds did not intervene. With regard to the order of the prevailing clouds at the time, they were *cirrus*, attenuated *cirrostratus* (in the latter the halos and parhelia were formed), and broken *cumuli* sailing beneath. There were also two currents of air, one from the West, the other from the NW. nearly. These strata of clouds, with the moist and wild appearance of the atmosphere, and the crossing currents, were sufficient to produce the refractions and reflections of the solar light in the existing vapour, and to generate the above-mentioned phenomenon.

The mean temperature of the air this month, is two degrees lower than the mean of July for a series of years. The atmospheric and meteoric phenomena that have come within our observation this month, are three parhelia, six solar halos, two meteors, lightning on two, and thunder on three days; and three gales of wind, namely, two from SW. and one from the W.

SUMMARY OF THE WEATHER.

A clear sky, 6; fine, with various modifications of clouds, 16; an overcast sky without rain, 5; rain, 4.—Total 31 days.

CLOUDS.

Cirrus 25, Cirrocumulus 14, Cirrostratus 31, Stratus 0, Cumulus 29, Cumulostratus 16, Nimbus 12.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	NW	Days
1	3½	2½	3	1½	7	8	4½	31

AUGUST.—The general character of this month to the 18th was warm and dry, excepting a few light showers of rain at the beginning: the latter part was humid, with frequent showers, a considerable decrease in the temperature of the atmosphere, and much lightning and thunder.

In the night of the 10th, there was vivid lightning and frequent peals of thunder from 11 P.M. till 2 A.M. Through the night of the 18th, it was very foggy. The sun having come to nearly the same declination as the planets Jupiter and Saturn on the 18th, a change in the atmosphere was induced, and light rain followed at intervals for the next six days, with lightning and distant thunder on the 19th, from 9 P.M. till midnight.

In the evening of the 25th at ten minutes before ten o'clock, many bright yellow columns of light, from half to two degrees wide, rose from an aurora borealis in the horizon, between the north and west points, above the tail of Ursa Major, or to an altitude of thirty degrees. At ten o'clock, eight of those liquid columns were up at the same time, and each of them very soon changed to a light-red colour. At twenty minutes past ten, they were most brilliant and numerous, and at forty minutes they ceased to rise, when a faint undefined auroral arch appeared from north to west fourteen degrees in altitude, and kept stationary in view till the moon rose between eleven and twelve.

In a few minutes after the first column appeared, a large brilliant meteor passed by Arcturus through a space of about twenty-five degrees, and left a thick sparkling train behind it for at least twelve seconds of time before it was extinguished; and four meteors of a smaller size soon followed.

In the afternoon of the 26th, a short but heavy shower passed over, with crossing winds, lightning and thunder: there was also lightning the same evening, and a faint appearance of the northern light through the openings in the clouds in the NW. quarter.

In the evening of the 27th, a faint auroral arch appeared between the north and west, from half-past eight till half past 9 P.M., and several columns emanated from it at intervals.

On the 29th, the barometer sank rather low, with a steady heavy rain from the NE. amounting to upwards of an inch in depth.

The opposition of the Georgian planet with the sun on the 30th, and the near conjunction of the sun and moon, lessened the mean temperature of the atmosphere five degrees, accompanied by heavy showers and lightning this and the following evening.

It is a general remark that the oldest farmer living cannot recollect the corn ripening faster than it did this summer to the 18th instant. The corn harvest commenced generally in the neighbourhood on the 8th and 9th of this month, and was carried on successfully, notwithstanding the daily light showers from the 18th to the 28th; but from the latter date to the end of the month the operations of the harvest were interrupted by heavy showers of rain: however, the wheat was cut and carried before they came on, and three-fourths of the barley and oats housed, or in ricks. Both the wheat and barley are considered by the farmers as average crops, and a great deal more than they expected; but oats have fallen short of it.

The atmospheric and meteoric phenomena that have come within our observation this month, are three solar halos, seventeen meteors, three auroræ boreales, lightning on five different days, and thunder on three days; and seven gales of wind, namely, two from NE., two from E., two from SW., and one from the W.

SUMMARY OF THE WEATHER.

A clear sky, $4\frac{1}{2}$; fine, with various modifications of cloud, $13\frac{1}{2}$; an overcast sky without rain, 8; foggy, $1\frac{1}{2}$; rain, $4\frac{1}{2}$.—Total 31 days.

CLOUDS.

Cirrus 24, Cirrocumulus 17, Cirrostratus 31, Stratus 0, Cumulus 27, Cumulostratus 11, Nimbus 18.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	NW	Days
$1\frac{1}{2}$	7	$4\frac{1}{2}$	3	1	$5\frac{1}{2}$	7	$1\frac{1}{2}$	31

SEPTEMBER.—The first part of this month was showery, and the latter part fine, with a dry easterly wind.

A sextile aspect of the planet Saturn with the sun on the 1st of September, decreased the temperature of the air till the 3rd.

Lightning and thunder in the afternoon of the 1st, and lightning in the evenings of the 2nd and 6th. On the 8th there were two coloured parhelia in the afternoon, when many cirri in white locks,

and beautiful beds of cirrocumulus in small and large round silvery flocks, were spread over a dark blue sky : both modifications changed to light-red at sunset. They were soon followed by rain and wind for five or six days. In the afternoon of the 13th a fine double rainbow appeared for several minutes.

In the evening of the 14th a rare phenomenon, the colourless lunar iris appeared in the nort-west quarter in a passing Nimbus soon after eight o'clock.

A little before and after sunset on the 28th, a rosy tint presented itself in the western hemisphere, and also a lilac colour about 14° above the eastern horizon.

The atmospheric and meteoric phenomena that have come within our observation this month, are three parhelia, nineteen meteors, one rainbow, one lunar iris, lightning on three days, and thunder on one; and ten gales of wind, namely, one from the NE., three from the E., one from SE., three from SW., and two from the W.

SUMMARY OF THE WEATHER.

A clear sky, 6; fine, with various modifications of clouds, 13; an overcast sky without rain, 7 ; rain, 4,—Total 30 days.

CLOUDS.

Cirrus 16, Cirrocumulus 12, Cirrostratus 23, Stratus 0, Cumulus 23, Cumulostratus 13, Nimbus 18.

A Scale of the prevailing Wind.

N	NE	E	SE	S	SW	W	NW	Days
1	5½	6½	2	2	6	2½	4½	30

October.—This month to the 22nd was fine and dry, excepting a few showers ; the latter part was cold and wet. Early in the morning of the 6th a storm of rain, thunder and lightning passed over.

The last assemblage of Swallows departed from this place on the 7th, making their stay here twenty-three weeks and four days. Early in the mornings of the 9th and 10th, and several mornings afterwards, hoar frost appeared. In the night of the 11th, there were a large lunar halo, and two paraselenæ, each of the latter was distant from the moon's centre twenty-three degrees.

In the evening of the 18th, an aurora borealis presented itself.

The maximum temperature of the external air occurred in the nights of the 26th and 31st accompanied with rain. The 28th was

showery with a gale from SW. which inosculated with an under current from the NW. in the afternoon, and produced heavy rain at intervals. There was a faint aurora borealis in the night of the 29th.

The atmospheric and meteoric phenomena that have come within our observation this month, are one parhelion, two paraselenæ, two solar and three lunar halos, fourteen meteors, two auroræ boreales, lightning on two days, and thunder on one; and six gales of wind, namely, two from SW., and four from the W.

SUMMARY OF THE WEATHER.

A clear sky, 5; fine, with various modifications of cloud, 13; an overcast sky without rain, $8\frac{1}{2}$; rain, $4\frac{1}{2}$.—Total 31 days.

CLOUDS.

Cirrus 18, Cirrocumulus 10, Cirrostratus 30, Stratus 1, Cumulus 22, Cumulostratus 12, Nimbus 17.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	NW	Days
$1\frac{1}{2}$	3	$\frac{1}{2}$	1	$\frac{1}{2}$	6	$9\frac{1}{2}$	9	31

NOVEMBER.—This month was frequently cold, windy, and mostly wet; but many fine summer days intervened. On the first, the pressure was very low, by means of rain and a gale from the SW. A parhelion appeared on the eastern side of the sun in the morning of the 2nd, and one meteor in the night. On the 5th, 12th, and 15th auroræ boreales appeared, also some bright meteors during their continuance.

In the night of the 6th, a little before 11 P.M., an *Iris Arcus pluvius nocte*, or rainbow appeared in the NE. quarter in a passing Nimbus, and the moon being within a few degrees of the horizon, the colourless bow formed an extensive arch a degree and a half wide.

The maximum temperature of the external air occurred in the nights of the 9th, 13th, 18th, and 21st. On the 19th, with a south-west wind, half an inch depth of rain fell here; yet the fall of the mercury in the barometer was slight, owing, as I supposed, to a dry upper current. Early in the mornings of the 16th, 17th, and 18th, a little ice appeared on the ground for the first time this autumn.

The atmospheric and meteoric phenomena that have come within our observation this month, are three parhelia, ten meteors, three auroræ boreales; and ten gales of wind, namely, one from NE., five from SW., three from W., and one from N.W.

AURORA BOREALIS.

A grand display of this interesting phenomenon occurred here on the night of the 5th of November. At six o'clock, there being a large opening between the clouds to the northward, about one half of an auroral arch of light presented itself, and terminated in the horizon at N. 30° 45′ E.; and the magnetic north in this latitude being now 22° west of north, half the base of the arch was 52° 30′, consequently its whole length was 105 degrees, as afterwards determined. When the clouds to the westward moved off, a few fine light streamers then rose between the north point of the horizon and the eastern end of the arch; but the moon, being nearly on the meridian and shining brightly, her reflected lights of course lessened the appearance of the aurora.

There was a tolerably well-defined black *screen-cloud* before, and parallel with, but not so high as the lower auroral arch by several degrees. I have observed for many years past that the screen-cloud almost invariably accompanies long continued aurora.

From this time the aurora was hid by the interposition of passing undulated cirrostratus and cirrocumulus clouds till nearly nine o'clock, by which time the moon had sunk near the horizon, so that the effect of the aurora was more favourable and interesting. Till ten it maintained a steady, mild light, similar to that which precedes the rising sun in a clear, calm, dry morning, with burstings out of bright lights at intervals from various parts of the lower arch, when its extent was as before-mentioned, and its altitude in the magnetic north 24°, as determined by the altitude of Beta Draconis, with that bearing a little above it. From these data the height of the aurora above the horizon may be calculated with the use of logarithms, by those in possession of the formula for that purpose. Two bright meteors rather low in the atmosphere appeared between the aurora and the zenith a little before ten.

From ten till a quarter to twelve, the auroral arch increased in brightness, and the emanations of magnetic matter, if it may be so named, were more frequent than before. Its greatest intensity of light occurred at midnight, when not only horizontal corruscations darted along the arch, but long and wide columns of bright light rose from it in abundance, and for the first time in the night changed to blood red, so that its reflection upon the water in Portsmouth harbour made it appear of a similar colour. The columns of light from the aurora soon after midnight actually passed the zenith, and even so far as Zeta in the foot of Perseus (see the Celestial Globe), where

they exhibited but a faint red, compared with the more northerly parts.

From twelve till nearly half-past the dense fluid (for the brightest stars could scarcely be seen through it) continued to spread from all parts of the auroral arch, and to appearance inosculated with the prevailing cirrostrative clouds, as in some places they changed to a lake colour, consequently nearly all the visible northern hemisphere, that is, from the zenith downwards, appeared in a blaze of these mixed colours for half an hour. I then began to look sharply after a large arch, bearing nearly east and west, but was disappointed in its appearance, notwithstanding the immense quantity of fluid matter thrown off from each end, and indeed from all parts of the arch. The aurora now began to recede slowly.

An aurora borealis appeared here on the night of November 12th, but as I did not see its commencement, it will be necessary for me to preface the following observations by stating that a friend of mine, John Meredith, Jun., Esq., first casually observed it, about thirty-five minutes past 5 P.M., and soon after called on me in haste, in order to direct my attention to its progress. He stated that he had just seen a fine luminous arch or band rise from the northern horizon, and that soon after it passed the zenith, a long lucid column of fluid rose from the northern horizon, and passed the zenith in the strong moonlight. When we arrived at a convenient place for observing, I perceived that much fluid matter had risen from below the horizon to an altitude of 40° in the north-west quarter, and changed to red; a little had also risen in the north-east quarter, and turned so red as to induce several persons to refer its cause to a fire in the neighbourhood. Five or six minutes before six o'clock, notwithstanding the light of the full moon, and her having risen upwards of an hour, I observed almost a perfect arch, a little wider and nearly of the same colour as a bright *lunar iris*, rising rather suddenly in the northern hemisphere; it soon passed the zenith, and proceeded southward.

At six, a very large and perfect semicircular arch of the same nature rose from that quarter, and also passed the zenith: its bearings, when in the zenith, were ENE. and WSW. nearly, and its width was between two and three degrees. Such an extensive arch is what I looked for on the night of the 5th, but I was disappointed. I should state that this arch from the aurora was not formed by the meeting and union of the fluid in the zenith from opposite points in the horizon, for it was perfectly formed before it was seen. These three auroral arches were all that appeared in motion on the present

occasion, and although I had seen similar ones some few years ago, I felt somewhat gratified, in consequence of their rare appearance.

From six till nine o'clock, a great quantity of fluid rose to thirty or forty degrees in height in the northern hemisphere; it invariably changed to deep red immediately after rising, and slowly passed off to the southward, as far as the eye could trace it in the horizon, from an elevated position. The white passing *Cirri*, or *Cirrus* clouds, during this interval, were abundant: they were wafted southward by a brisk northerly wind, sometimes appearing above, at other times beneath, and frequently mixed with the red patches of fluid from the aurora.

At ten minutes after eight, a large and brilliant meteor fell almost perpendicularly, through a space of about twenty-six degrees, between the north and east, and then burst into several sparks and colours, similar to the explosion of a sky-rocket.

At twelve minutes past nine two splendid light-yellow columns of fluid rose alternately from the horizon, due north—one passed Polaris, the other reached beyond the constellation Cassiopeia, then nearly in the zenith, and the fluid that composed them spread considerably, and changed to light crimson. These were followed by other columns of equal grandeur in the north-west quarter.

I shall now pass over several minor appearances. The lower auroral arch, from which the fluid emanated, did not make its appearance till between nine and ten o'clock, and at thirty-five minutes past ten it distinctly showed itself, when by measurement it was ninety degrees in extent along the horizon, and seventeen and half degrees above it in the magnetic north, being its maximum altitude; and as often as the coruscation rose from it, they changed to red of different shades. Soon afterwards, there appeared several small rings of colours round the moon, the exterior ring being seven degrees in diameter; they indicated a current of air at a great height. No columns of light were observed to rise from the aurora after half-past eleven, but red patches of fluid occasionally appeared in the north-west and north-east quarters till nearly one, A.M. and dispersed southward till between one and two o'clock. I am apprehensive that as the red fluid sometimes appeared above, at other times below, the passing *Cirrus* clouds, their motion must have been in some degree accelerated by the brisk current of air from NNW., and yet their motion southward seemed much slower than that of the clouds.

In describing the moving auroral arches as above, I intended to add, that although they may appear arched to the eye when cut by the horizon, yet they may be straight or longitudinal lines of an unlimited

extent to our *view*, which is confined to about thirty miles on each side of the meridian; for all lines of cloud or other matter in the celestial concave, appear to us as arcs of circles, when so cut by the plane of earth. This curious effect gives scope for reasoning on the hallucination of direct vision in the concavity of the sphere.

The barometer rose slowly with the current from NNW. till it shifted westward towards the morning, and the night was cold; the depression, however, of five degrees of mean temperature of the atmosphere was not occasioned by the aurora, but by the conjunction of the planet Saturn with the sun. To-day, one-third of an inch in depth of rain has fallen here, accompanied with a brisk wind from the Atlantic. This evening, November the 14th, a cold and strong gale of wind is now blowing from NE. by N.

On the morning of the 15th, at half-past 5 P.M., I perceived a faint light slowly rising above the northern horizon, and at ten minutes to six, just before the moon rose, the upper part of the aurora was sufficiently luminous and well-defined to enable me with a sextant to measure its extent, which was 98° and its altitude 15°. The black screen-cloud rose parallel with, and to within 3° of the upper part of this arch of light.

At six a bright lofty meteor fell from a great height towards the west. The aurora then sank four or five degrees, which considerably contracted its arch and chord.

At twenty-four minutes past six the aurora again rose to near Alioth, the first star in the tail of Ursa Major, or to 19° in the magnetic north, and it extended to 101°, when an extensive cloud of magnetic fluid rose from it between due north and NNE., with four or five bright beams, a degree and a half wide, which passed the polar star, and the fluid immediately changed to a crimson colour. The aurora again sunk to its former position.

At a quarter to seven, there was a brilliant display of broad lucid columns from all parts of the aurora, similar in appearance to the bright solar rays which are sometimes seen reflected upwards from behind a dense cumulus or cumulostratus cloud, commonly called solar lights and shades: most of these columns on each side of the meridian passed Polaris nearly to the zenith, and the great quantity of fluid thrown up almost overspread the visible northern hemisphere, and changed to red and crimson, through which the principal stars in the Little and Great Bear, shone apparently red. This was the most gorgeous and interesting display of the aurora, which must have struck

reverential awe in the minds of those who observed it. It lasted about twenty minutes, when the aurora again receded. The magnetic needle at the first appearance of the aurora was N. 22° 2′ W., and at seven o'clock, I found it had receded to north N. 21° 48′ W. a deviation of thirteen minutes of a degree, as influenced by the spread and union of the magnetic with the electric fluid in the lower medium of the atmosphere.

On this and other occasions the long bright columns from the aurora were nearly parallel with each other at their bases, where they were broadest, and converged to a point in the plane of the magnetic meridian far beyond the zenith.

Between eight and nine, many faint columns rose in the north-west quarter, and assumed a crimson tint. Soon after nine the aurora disappeared, and the night was fine and frosty. I think the aurora borealis appeared in higher north latitudes on the two intervening nights between Sunday and Wednesday, when it was seen here, because the clouds, which overcast the sky, were very red at intervals from eight till between ten and eleven P.M.

As I may not see this beautiful meteoric phenomenon for some time to come, I will briefly state to you one or two specimens that have not occurred lately, and which I have formerly seen; that is, a great quantity of magnetic fluid thrown off the horizontal arch of light about four or five times in a minute, to a considerable height above the earth's atmosphere, in the form of long waves at right angles with the magnetic meridian; and from the same arch of light extensive flashes of the fluid, similar to those which emanate from surcharged clouds in and near the horizon after a hot summer day. There is also another astonishing specimen that I have seen, namely, long, short, and very pointed coruscations rising in rapid succession for a long time from all the upper parts of the aurora when very luminous; which specimen, with its variegated colours, was, in times of superstition, compared by the unlearned to glittering swords, daggers, bayonets, and in short to contending armies.

As the aurora borealis, or broad arch of horizontal light, always extends to equal distances on each side of the magnetic meridian. I think that no reasonable argument or mathematical investigation can now be brought forward to prove that the northern lights are generated by any other means than the superabundant magnetism of the earth, more especially as magnetic and electric fluid are, with some modification, chemically considered as gaseous substances of a homogeneous quality.

SUMMARY OF THE WEATHER.

A clear sky, 4; fine, with various modifications of cloud, 11; an overcast sky without rain, 9; rain, 6.—Total 30 days.

CLOUDS.

Cirrus 16, Cirrocumulus 5, Cirrostratus 29, Stratus 0, Cumulus 17, Cumulostratus 8, Nimbus 18.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	N	Days
3½	3	1	½	0	8	6½	7½	30

DECEMBER.—This month has been very mild for the season, and wet, particularly the latter part, the mean temperature of which was equal to the middle of October.

In the evening of the 4th, there was a lilac blush in the twilight as high as the zenith, and a deep red in the SW. horizon after sunset.

In the evening of the 6th, we had a light shower of granular snow, the first that had appeared this season. Early on the 7th, the distant hills were lightly covered with snow, and sleet fell at intervals. The maximum temperature of the external air occurred in the night on the approach of rain from the SW., also in the nights of the 9th, 19th, and 22nd. A large lunar halo continued through the night of the 14th.

The atmospheric and meteoric phenomena that have come within our observation this month, are one lunar halo, one meteor; and seven gales of wind, namely, one from E., one from S., and five from SW.

SUMMARY OF THE WEATHER.

A clear sky, 2; fine, with various modifications of cloud, 8; an overcast sky, without rain, 14; foggy, ½; rain, 6½,—Total 31 days.

CLOUDS.

Cirrus 10, Cirrocumulus 6, Cirrostratus 31, Stratus 0, Cumulus 7, Cumulostratus 6, Nimbus 18.

A Scale of the prevailing Winds.

N	NE	E	SE	S	SW	W	NW	Days
2	5	3	2	8½	4½	4½	1½	31

*** This Retrospect for Gosport contains much useful information, mingled, however, with various hypothetical allusions to certain planetary influences. But we are not responsible for incidental, any more than for general meteorical speculations.—EDITOR.

GENERAL RETROSPECT.

From the insular situation of England, it must, in common with all other islands, experience to a certain degree a variable atmosphere: this probably arises, not only on account of its exposure to the water or sea by which it is surrounded, but on account of its peculiar geographical situation, it becomes the recipient of more distant phenomena; these greatly affect its temperature, and consequently produce more frequent and sudden changes in its atmosphere, than in countries on the continent. Its distance from the equatorial and polar parts of the earth, its situation with respect to the great European continent on the east, the regions of perpetual cold on the north, and an extensive ocean to the west pre-eminently distinguish it as the seat of effects of a general or widely distributed nature, and not as the source to which atmospherical disturbances may be traced; excepting those which are of a local nature, and admit of a general explication. Notwithstanding the unfavourableness of these influential causes, it is exempt from the extreme severity of heat or cold felt by those situated between the same parallels of latitude.

The ever varying state of the climate of Great Britain, has led to much enquiry; and several hypotheses have been raised to account for it; but unfortunately the enquiry has been confined merely to the locality in which the phenomena were observed; and, consequently, each hypothesis, instead of unravelling the mystery, has made its solution the more difficult. The decrease of the temperature of our island during the summer months, and, the comparative mildness of our winter to what they were formerly, as deduced from the successful plantation of the vine, &c., compared with what are now produced, has led many to conclude that cycles, extending to one or two thousand years, more or less, may possibly exist. The apparent analogy of the state of the weather for one year, with that of some one other year which preceded it, whether it be a coincidence after an interval of five, nineteen, or if fifty-three years; or if only an approximation be noticed between year and year during these epochs, it is considered by their authors to be just and reasonable evidence of the truth of the weather *cycles they have adopted.*

Some member of a literary and scientific institution, with a smattering of astronomy, has suggested that the change which has taken place in our geographical position, in consequence of the gradual lessening of the angle formed by the equator and the ecliptic, called the nutation of the earth's axis, and the retrograde motion observed in the apparent situation of some remarkable fixed stars, called the precession of the equinoxes, will fully account for the change which has taken place in

our climate. But admitting that something of the kind might account for a change some millions of years hence, the aggregate of mere centuries would not amount to sufficient aberration, to justify this as *the cause* of the change; indeed, our neighbours who inhabit the same parallel of latitude on the continent, should experience a change also, which is not the case.

The introduction of canals and large masses of stagnant water, the increase of pasturage lands, and the decrease of tillage, enclosure of the open fields and waste lands, and intersecting them with fences of hawthorn, &c.—the introduction of exotics, and the plantation of such trees, whose power of exhaling is considerable, together with the quantity of free thermometrical heat given out in the process of combustion from manufactories and gas lights,—an increased population, and consequently additional animal respiration—these, with others too numerous to particularize, are pointed out by their respective authors as *the cause* of the changeableness of our atmosphere.

With such profuse and anomalous causes as the preceding accounts assign to derangements of climate, it is difficult to deal summarily: we must, therefore, make a few remarks, before we proceed any farther.

We need not be surprised at the introduction of *cycles*, or any other means by which, it was presumed, mankind might prognosticate the changes of the atmosphere. In proportion to the difficulty of any subject, regarded as a desideratum, the mind will be led to receive and rest in any thing and every thing which appears to throw the least light upon a fancied discovery. Man is dependent upon the weather, not merely for health and comfort, but every convenience of life; and therefore, to be able to predict the weather with certainty, has ever been an object of the most avowed solicitude. But we cannot but confess we feel no little astonishment that men, nay, even philosophers, so far from combatting the difficulties this part of meteorological dynamics present, should run into extremes, without the least evidence of their proof, and even to venture to draw conclusions which are drawn from no other premises than what the perplexing difficulties the subject affords! Philosophers of high and established reputation have asserted that nature undergoes an entire change, after the lapse of 2,000 years, and that every property assumes its opposite; but the truth of this, no one has ventured to prove; and supposing it had been established as an incontrovertible fact, it would afford no kind of proof, either of the reality or consistency of weather cycles, of any such epocha; for then, instead of having each successive year of the new epocha in exact correspondence with the order of the past epocha, they would be diametrical to each other. And why not adopt cycles equally protracted to all parts of the globe? Egypt,

Greece, and other parts of the world, of which we possess any authentic information, from their earliest history to the present time, do not present any facts in corroboration or support of the hypothesis; and it is not a little singular that the Chinese, with all their ingenuity and love of the marvellous, do not appear to have broached any such opinion!

Among the most prominent weather cycles, is that of fifty-three years, or six complete revolutions, when the lunar perigee returns to the same situation as at first; so that the fifty-fourth year would exactly resemble the first—the fifty-fifth the second—and so on, until the cycle was completed. The time when the new and full moon returns to the same day in the Julian year, or a period of nineteen years, is considered a satisfactorily-proved cycle. Some again suggest a cycle of 100 years; others, to make it appear more mathematical, suggest the division of this cycle at right angles, or a period of twenty-five years. And last, though not least, in the list of *epochal accommodations*, is the correspondence of the seasons every nine years! It is, however, worthy of remark, that the advocates of weather cycles are so much at variance among themselves as to the time when a cycle actually commences, that we need not wonder at their disparagements. Epochs of one, five, nineteen, and fifty-four years, appear to us as inexplicable as the great circle of the Irish schoolmaster, said to be made by a continuous line "*joined, conjoined,* and *disjoined.*" It is nothing remarkable, in the course of many years' observation, that the amount of rain which falls in one year should correspond with the first or second of the *eighth or ninth* preceding years—for all the *epochalers* give or take a year's "grace," as the occasion may require, to help them out of their difficulty! But let a candid observer examine a series of observations, embracing every particular of the pressure, temperature, &c., from 1796 to 1815, and from 1815 to 1834, and note how far these epochs are borne out and established. The phenomena of one cycle should exactly correspond with its predecessor; or to what purpose are they given? We doubt not, however, our readers, who have examined the tables for their guidance, are prepared to give judgment against them. Nor should we have thought it necessary to have entered upon the subject, had not weather cycles been revived during the past year, by an author "very far north."

That the causes enumerated at page 149 must influence the climate, by aggregating its temperature and humidity, no one will deny; but that they should be so influential, and occasion so great an alteration, as that our summer is like what spring formerly was; and that the winters of the nineteenth century resemble the autumnal seasons of the seventeenth century, we are disposed to question. In our tables for 1838 (which will contain meteorological registers from thirty stations, in

Great Britain and Ireland,) we intend giving a chart, which will show not only the cause of the change in the general character of our climate, but also *how* and *when*, apart from *predictions*, those constant changes of the weather occur in the several localities during each successive season of the year.

To obtain an accurate knowledge of atmospherical phenomena we would recommend meteorologists to make a change in the hours of observing the barometer, thermometer, &c., though not without recording the alteration in the registers. Were the observations recorded for three years, at 9 A.M., 3 P.M., and 9 P.M.; a second series might be taken at 7 A.M., 12 noon, and 6 P.M.; a third series at 7 A.M., 11 A.M., and 7 P.M., and so on until we obtained *hourly* observations for every day in the year. This would greatly lighten the task of observers and put them in possession of many facts of which they are now ignorant, and with comparatively little difficulty, as the plan is more simple and less arduous than a series of hourly observations.

The desire of the meteorologist is not simply to observe when *a change* occurs in the atmosphere, but to ascertain *the cause* which destroys the equilibrium of the atmosphere; and also whether the disturbing cause be of a local or general nature. This, indeed, requires a great combination of agency; but the claims we make upon meteorologists, is no greater than meteorological science demands. Without co-operation as extensive as this "world's wide domain," the science of meteorology will elude our grasp, with the tenacity and subtlety of the invisible fluid that surrounds us.

To facilitate this inquiry—an inquiry which involves national and individual interests—we suggest that, a meteorological committee be formed in various parts of the globe, to observe the time of any change in the state of the atmosphere, not by hourly or stated periods, but to take it in turn to watch when any alteration took place in the electricity, gravity, humidity, or temperature of the atmosphere, and record the fact of a change *first*, and the *time* of its occurrence *afterwards*. One observer might watch the barometer and magnetic needle; a second to observe the wet and dry bulb thermometers; a third to note the general character and state of the atmosphere, and the indications of an apparatus for collecting the electricity of the atmosphere: the result would be, that we should possess meteorological statists claiming unequivocal reliance, and it would also afford us the only data on which meteorological dynamics could be tested and refuted or established. If it be considered too laborious for the committee, we would say let every individual who feels an interest in, or will derive any advantage from, the advancement of this branch of physical science, subscribe towards remunerating such as are prompted by

a natural enthusiasm, and would undertake the task; the committee might apportion to the three observers their respective duty during the day and at night. And if, after two or three observations of every change that took place in the atmosphere, any connection should be found to exist in the natural character of the changes in certain months, days, or hours, the committee might then recommend these seasons as those the most likely to afford data to determine the time of atmospherical disturbances: and, the comparison of the whole series of observations would enable us to trace these disturbances to their origination, and also to determine whether their influence was of a general or local nature. The results of these committees would be of more real utility than the isolated observations of centuries.

We are aware of the difficulties attending a work of such magnitude, but the importance of a correct knowledge of meteorological phenomena is such that neither labour or expense should be wanting to obtain it. We would recommend the observations to be taken at London, Edinburgh, Dublin, Paris, Brussels, St. Petersburg, Lisbon, Milan, Vienna, Teflis, Cape of Good Hope, Bombay, Madras, Sierra Leone, Biafra, Mecca, Calcutta, Ceylon, Australia, Mauritius, Pekin or Nankin, Borneo, Kamtschatka and Spitzbergen, in the eastern hemisphere, and at New York, one of the Canadas, Albany, Newfoundland, Mexico, West India Islands, Panama, Quito, Guayana, Rio Janeiro, Buenos Ayres, Cape Horn, Valparaiso, Lima, Cusco, Fort de Beira, Santa Cruz, New Zealand, Otaheite, the Carolinas, and the Sandwich Islands in the western hemisphere.

Perhaps there are no individuals by whom the work would be so easily accomplished as those persons who are engaged in the light-houses and floating lights round the various coasts; particularly the light-houses on the coast of Great Britain and Ireland. We could wish to see the honourable corporation of the Trinity-house set the example to the depots de la marine of our continental neighbours, by instituting these inquiries in the light-houses under their direction. We would also suggest to the Meteorological Society the propriety of granting silver medals for the best and most extensive series of observations taken by persons employed in the light-houses. The circumstance of observing in the light-houses would alone be productive of great good to the mercantile marine; who, instead of neglecting the vacillation in the tube of the barometer, would regard its indications to be of the utmost importance.

LONDON: PRINTED BY STEWART AND MURRAY, OLD BAILEY.

ERRATA.

Page 2, line 29, *for* matin, *read* matina.
— 12, — 27, *for* adjourning, *read* adjoining.
— 20, — 7, *for* form, *read* avoid.
— 31, — 29, *for* Mr. *read* Dr.
— 36, note, *for* obscure, *read* unexplained.
— 40, line 22, *for* is, *read* be.
— 64, note, line 1, *for* cement, *read* current.

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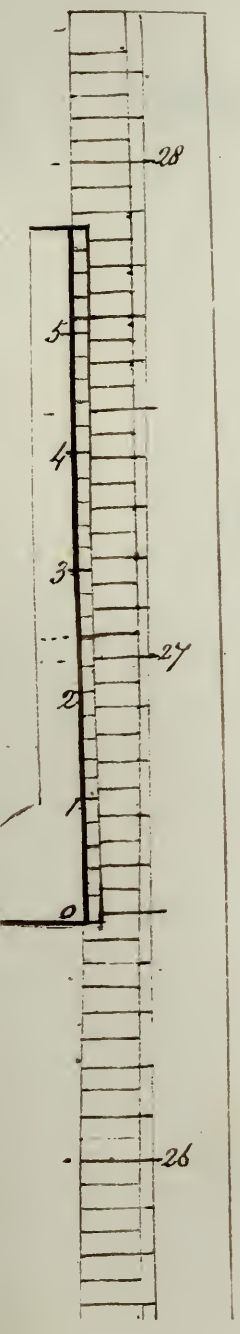

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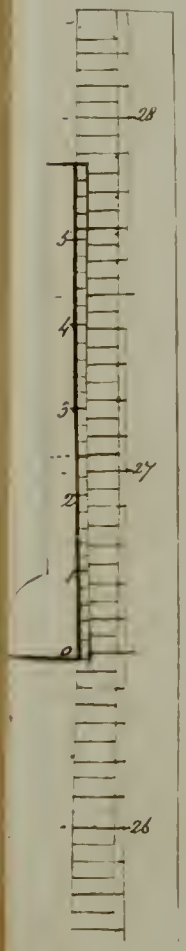
Newman's Mountain Barometer.

The way in wh. the hundredths are estimated may be seen from the following instance.



The zero point of the vernier being in the position represented in the figure, read off the no of inches, & tenths of inches, in this case 26·4, add in this case $\frac{5}{10}$ of $\frac{1}{10}$ = to $\frac{5}{100}$, making 26·45. Then for the smaller portion yet remaining it is seen that the line of the vernier, wh. coincides with a line on the instrument, is between the numbers 2 & 3 on the vernier, there are therefore two hundredths more to be added, making 26·47 in., and as the line on the vernier i the second above the two-hundredth, there are 2 five-hundredths, or $\frac{2}{1000}$ in. to be added, & the total height of the barometer is 26·474.

SUPPLEMENTAL

INSTRUCTIONS

FOR THE USE OF

THE MAGNETICAL OBSERVATORIES.

PRINTED BY ORDER OF

THE COMMITTEE OF

PHYSICS AND METEOROLOGY

OF

THE ROYAL SOCIETY.

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RED LION COURT, FLEET STREET.

1841.

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RED LION COURT, FLEET STREET.

SUPPLEMENTAL INSTRUCTIONS FOR THE USE OF THE MAGNETICAL OBSERVATORIES.

January 15th, 1841.

It is desirable that observations of the magnetic inclination should be made more frequently than was contemplated in the original instructions, so as to obtain a good approximation to the mean inclination in each month, independently of the magnetometers. It is proposed to accomplish this by *eight* absolute determinations in each month, made at nearly equal intervals throughout the month. The days of observation may be *Tuesdays in the forenoon*, and *Fridays in the afternoon*; the time being not less than three hours distant from noon (observatory time) on both days, and so arranged that one of the magnetometer hours may coincide nearly with the middle time of the observation. If Mondays and Thursdays, or Wednesdays and Saturdays, are found more convenient than Tuesdays and Fridays at any of the observatories, they may be substituted; but the days and hours once fixed by the director ought not to be subsequently changed.

The spot at which these observations are made should be always the same; and it should be sufficiently remote from the magnets of the observatory, and from other disturbing influences. A solid foundation for the instrument, and a protection from the weather, will be required. The same needle should always be employed. If practicable, it may be convenient to leave the apparatus in its place, its plane being in the magnetic meridian, and to remove the needle alone after each observation.

It does not seem necessary that these observations should be accompanied by a simultaneous series with the two intensity magnetometers, as recommended in the original instructions.

It is recommended that the method of observing the declination and horizontal-intensity magnetometers be modified; and that, instead of making the three readings at three successive limits of the arc of vibration, they should be taken at the times

$$T - t,\ T,\ T + t,$$

T being the appointed epoch of observation, and t the mean time of oscillation of the magnet, neglecting the fractional parts of a second.

This modification of Gauss's method seems (all things considered) to be the best, when the arc of vibration is small, as is the case when the copper rings are used; otherwise the method originally recommended seems preferable.

August 21st, 1841.

Since the publication of the Instructions for the use of the Magnetical Observatories, in the Report of the Committee of Physics and Meteorology of the Royal Society, experience has suggested the necessity,—not only of new series of observations bearing upon definite points of research,—but also of modifications in some of the methods of observation originally recommended, and of additional

information respecting others which had been only briefly touched upon. The Circular dated the 15th of January 1841 has pointed out some of these desiderata; and the present instructions have been prepared, in order to embody the suggestions of subsequent experience.

Horizontal Force Magnetometer.

In the original instructions* a method has been suggested by which the horizontal force magnetometer may be employed in the determination of the *absolute horizontal intensity*,—the measures taken with this instrument furnishing the product of the earth's force into the moment of free magnetism of the suspended bar. The results of this method, however, are inferior in accuracy to those obtained in experiments of vibration, with the aid of the declination magnetometer. One of the chief causes of this inferiority seems to be, that the elasticity of the suspending wires (a force not easily valued) conspires with the directive force arising from the weight in determining the position of equilibrium; and if, to remedy this, parallel fibres of silk be adopted for the suspension, we are involved in the uncertainty of the position of the resultants of these parallel strains, in determining the interval of the suspending threads. But beside this inferiority in accuracy, the method is also objectionable on other grounds, the employment of it creating a break in the series of observations of intensity changes.

The constancy of the magnetic moments of many of the bars seems to hold out the hope, that the horizontal force magnetometer may serve to indicate the changes of horizontal intensity which take place from month to month, if not the annual change of that element itself. In this point of view, therefore, it is important to *avoid all breaks* in the series, such as are caused by a removal of the magnet, and readjustment of its position. [It may be possible to preserve the continuity of the series, even when a change of moderate amount has taken place in the magnetic moment. Thus, when this change has been such as to carry the bar near to the limits of its scale, with respect to the line of collimation of the reading telescope, the best course is, perhaps, to bring back the bar, by moving the arm of the torsion circle,—taking care always to note the angle, and making, of course, a corresponding change in the coefficient.] It is therefore *inexpedient to remove the magnet for the determination of the changes in its magnetic moment*, unless these changes should be so considerable as to cause great derangements in its position of equilibrium. Where such displacements fall within the limits of the scale of the instrument, the corresponding changes of magnetic moment may always be determined by a comparison of the readings with the cotemporaneous observations of absolute intensity. For the same reasons it is *inexpedient to remove the magnet in experiments of absolute intensity*. In its place, it will serve at once to determine the changes of intensity which may occur in the interval of the two parts of the observation, and thus to supply the required correction in the value of m X. The effect of the horizontal force magnet, in altering the value of X deduced from observations

* Report of the Committee of Physics and Meteorology, p. 28.

with the declination magnetometer, may be entirely annulled by a proper relative position of the two instruments *; and in cases where this position has not been attended to, and where alteration is inconvenient, the effect may be determined experimentally, and allowed for as a correction.

Vertical Force Magnetometer.

Much difficulty having been experienced in the manipulation of this instrument, it may be useful to note briefly the causes of error, and some of the means of alleviating them. Under the most favourable circumstances, and with the best management, the results obtained with the vertical-force magnetometer are, undoubtedly, inferior in accuracy to those of the horizontal-force instrument. This inferiority is to be traced to the large influence which the unavoidable errors of workmanship must necessarily have on the position of equilibrium of a magnet supported on a fixed axle. It has been shown that the effect of magnetizing a bar, under the most advantageous circumstances of form, and at the part of the globe where the vertical component of the magnetic force is greatest, is the same (as to its position of equilibrium) as if its centre of gravity had been transferred about the $\frac{1}{40}$th of an inch towards the north end; so that the moment of the force, exerted by the vertical component of the earth's magnetism, can never exceed this small quantity multiplied by the weight of the bar. Now, in order to render the results of this instrument at all comparable to those of the horizontal-force magnetometer, it should enable us to measure changes of the vertical force, amounting to the $\frac{4}{100,000}$dth part of the whole; *i. e.* we have to measure effects such as would be produced by shifting the centre of gravity through the one-millionth of an inch. It will be easily understood, from this statement, how great must be the effect of a minute disturbance of the relative parts of the instrument, or of inequalities in the bearing points of the axle; and experience has accordingly shown that it is altogether unavailable for the determination of changes of long period.

Still, when originally well constructed, and with proper management, the vertical-force magnetometer seems to exhibit the laws of the diurnal changes, as well as those of the momentary fluctuations, with tolerable fidelity; and it is therefore important to advert, briefly, to the conditions to be attended to in its manipulation. The first of these is to give sufficient sensibility to the instrument. This is accomplished by raising the centre of gravity by means of the vertical screw; and the sensibility attained will be judged of by the time of vibration of the needle upon its knife edges, this sensibility increasing as the square of the time of vibration. Care must be taken, however, in raising the centre of gravity, not to render the instrument too sensible, still less to convert it into an oversetting balance; in the one case, the magnet is carried out of the field of the microscopes by every considerable change of intensity; in the other it is wholly useless. It will be

* See "Supplement to a paper on the mutual action of permanent magnets, considered chiefly in reference to their best relative position in an observatory." —*Transactions of the Royal Irish Academy*, vol. xix. part 1.

easily seen from the formula for the value of the coefficient*, that the proper value of the time T will vary with the inclination at the place of observation.

Again, it is found that the time T, and therefore the sensibility, is in some cases subject to frequent and often continuous changes. It becomes therefore necessary to observe this time frequently, (once a week, or oftener) in order to obtain the value of the coefficient. The time of vibration in the horizontal plane, T', is not liable to vary, except from variations in the magnetic moment of the bar.

Auxiliary Apparatus.

It is desirable that every Magnetical Observatory should be furnished with an auxiliary apparatus similar to the declination magnetometer. Some of the uses to which such an instrument may be made subservient, have been already adverted to in the original instructions; others will be explained in those that follow.

The auxiliary apparatus, here recommended, differs from the declination magnetometer chiefly in its dimensions. The magnet-bar is 12 inches in length. The height of the supporting pillars is 24 inches; and the interval of their axes is 12 inches. The box is rectangular, instead of circular; and is made in two parts, which are joined by dovetails. Its length is 15 inches, its breadth 7 inches and depth 5 inches.

This apparatus may be placed in the small pavilion, which has, at most of the Observatories, been constructed for the reception of the inclination instrument; and its employment being only occasional, it will not interfere with the use of the latter instrument. It will be only necessary to erect an additional pillar at a distance of about six feet from the stand of the instrument itself, for the support of the observing telescope. The telescope should, of course, be protected from the weather by a cover, if without the pavilion.

Temperature Corrections.

The effect of temperature upon the magnetic moments of the bars, has been investigated by causing them to deflect the declination magnet, and observing the deflections produced when the bars are differently heated. For this purpose, a small copper trough is provided, having a cock near the bottom. In this the magnet to be tried is placed, supported on two cross ledges; and beside it a verified thermometer. The trough is then filled with water, and placed so that the axis of the magnetic bar may lie in the east and west line, passing through the centre of the declination magnet. The apparatus being allowed to rest a sufficient time, so as to permit the magnet and the thermometer to take the common temperature of the surrounding fluid, this temperature is noted and the deflection observed. The temperature is then raised, by letting off some of the water by means of the cock, and supplying its place by heated water; and the experiment is repeated. In this manner a series of observations is made, at temperatures varying, in an ascending and then descending scale, from the temperature of the air at the time of the ex-

* Report of the Committee of Physics and Meteorology, page 33.

periment to about 90° Fahr.; and, should the temperature of the air be high at the time, the scale is extended in the opposite direction, by surrounding the vessel with ice or some freezing mixture.

The results hitherto obtained by this method at some of the Observatories have not been altogether satisfactory, the partial results presenting considerable discordance. This discordance appears to be owing, partly to the smallness of the angle of deflection employed, and partly also to the neglect of the variations of the horizontal intensity in the reduction of the results. In order to render the method accurate, in these and other respects, the following mode of experiment and reduction may be advantageously adopted.

It will be expedient to employ, for this purpose, the auxiliary apparatus already described. The deflecting magnet being in its place, and having acquired the temperature of the water in which it is immersed, the observer is to note that temperature, and to observe the coinciding division of the scale. At the same time, an assistant should observe the declination and horizontal-force magnetometers. The angle of deflection, u, will be given by the formula

$$\tan u = n \tan a,$$

in which n is the corresponding number of divisions of the scale, and a the angle corresponding to a single division.

Now let the temperature be raised about ten degrees, and the observation repeated,—the observer noting the division of the scale corresponding to the new temperature, and his assistant observing, as before, the two magnetometers. Let Δn be the change of reading, corresponding to the change of temperature Δt. Also, let Δa be the change of declination (in parts of radius) which has occurred in the same interval of time—the positive values being measured in the same direction as the deflection;—and $\frac{\Delta X}{X}$ the corresponding change of the horizontal force, in parts of the whole. Then the change of the magnetic moment of the bar, q, corresponding to a change of one degree of temperature, will be given by the formula

$$q \Delta t = \frac{\Delta a}{\frac{1}{2} \sin 2u} - \left(\frac{\Delta n}{n} + \frac{\Delta X}{X} \right).$$

And if several observations be taken, between the limits of temperature t_o and t_m, there is finally

$$q \left(t_m - t_o \right) = \Sigma \left\{ \frac{\Delta a}{\frac{1}{2} \sin 2u} - \left(\frac{\Delta n}{n} + \frac{\Delta X}{X} \right) \right\}.$$

In this manner we obtain two values of q, one from the ascending, and the other from the descending series of temperatures. Should any difference be found in the results of these two series, the latter seems to be entitled to more confidence; because a certain small portion of the force is, in general, permanently lost by any considerable elevation of temperature.

But, in the case of the horizontal-force magnetometer, a further correction is required for the effects of temperature upon the suspending wires, and upon the wheel and screw which determine their

interval ; their dimensions being increased by an augmentation of heat, and the directive force therefore altered. The correction in the value of $\frac{\Delta F}{F}$, due to this cause, is

$$\frac{\Delta G}{G} = (2e - e')(t - 32°) ;$$

in which e denotes the coefficient of the expansion of brass, and e' that of silver,—the metals of which the wheel and screw, and the suspending wires, are formed. Hence the whole effect of temperature will be corrected, by taking as the coefficient of $(t - 32°)$ the quantity

$$q + 2e - e',$$

instead of q. The additional terms thus introduced, however, are small ; the numerical value of $2e - e'$ being only ·000010.

It may be useful to observe that this combined result of the two-fold effects of temperature may be *directly* obtained, by simply observing the changes of intensity indicated by the horizontal-force magnetometer itself, when the temperature of the surrounding air is artificially raised or depressed through any considerable amount ; the actual changes of the earth's force being meanwhile determined, by observing the time of vibration of the declination bar. The difficulty in the practice of such a method will consist chiefly in producing a sufficient change of temperature within a moderate time, without, at the same time, giving rise to currents of air and other disturbing influences. This difficulty may in part be overcome, by placing the instrument in a small chamber, such as the pavilion of the inclination instrument. There must remain, however, much uncertainty as to the true temperature of the magnet-bar, owing to the length of time necessary to enable it to assume the temperature of the surrounding air, and the difficulty of maintaining that temperature uniform.

Term-Day Observations.

Experience has shown that the interval of ten minutes, at which each of the force magnetometers has been hitherto observed on Term-days, is too great ; and that, in seasons of disturbance, some of the fluctuations of the intensity thus escape observation. The following plan of observation is accordingly recommended, in place of that originally proposed.

Each of the three magnetometers will be observed on Term-days at intervals of *six minutes* ; so that ten observations will be made with each instrument every hour. By this arrangement an observation will be taken *every two minutes* ; and the instruments will be observed in the order—Declination, Horizontal force, Vertical force —the declination magnetometer being always observed at the *full hour* of Göttingen time. The days and hours of commencement will remain as already appointed.

It is proposed that this change in the method of observation, shall commence on the Term-day of January 1842. The same plan of observation will be followed also in the Triple observations, and in all observations at short intervals.

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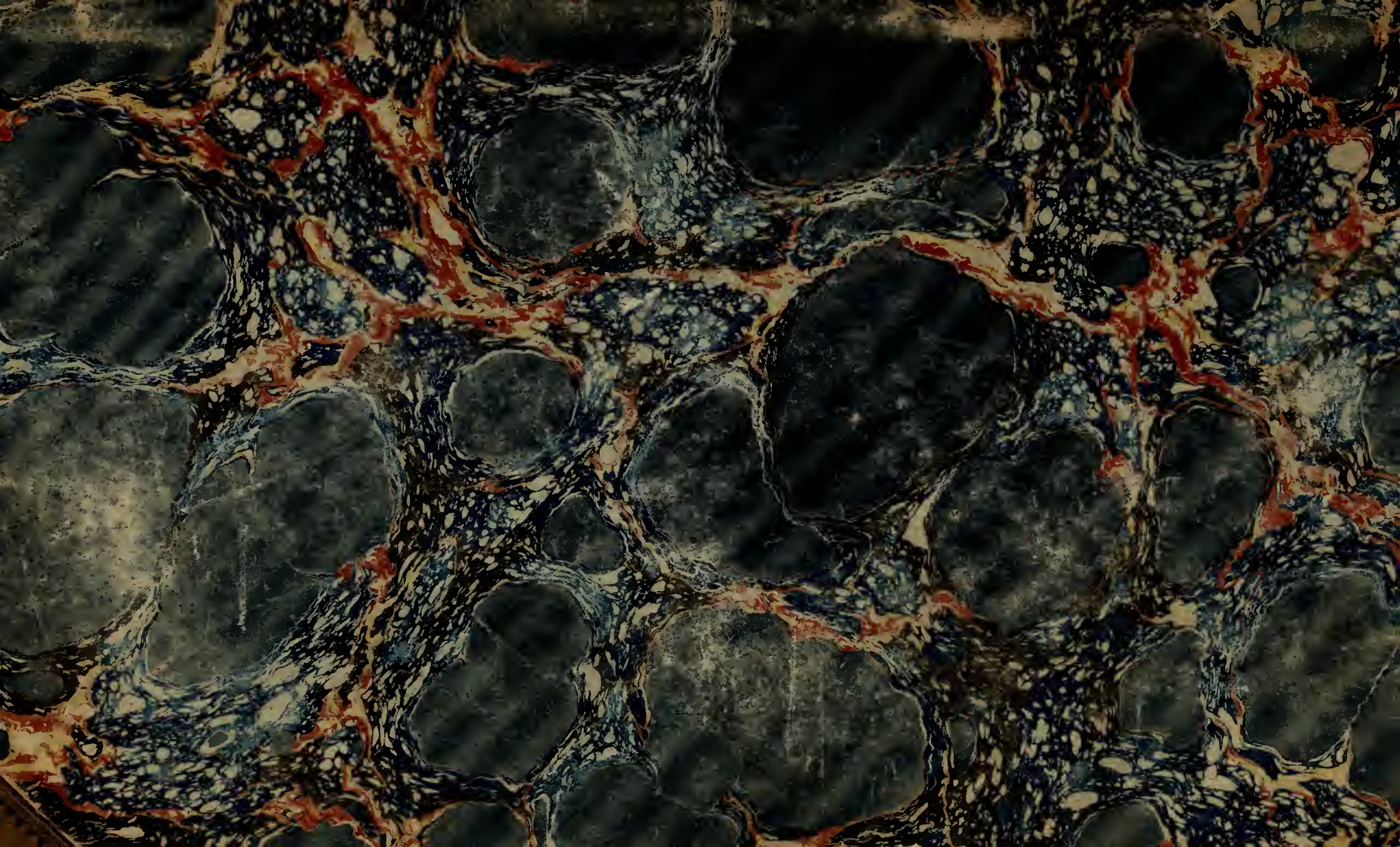
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